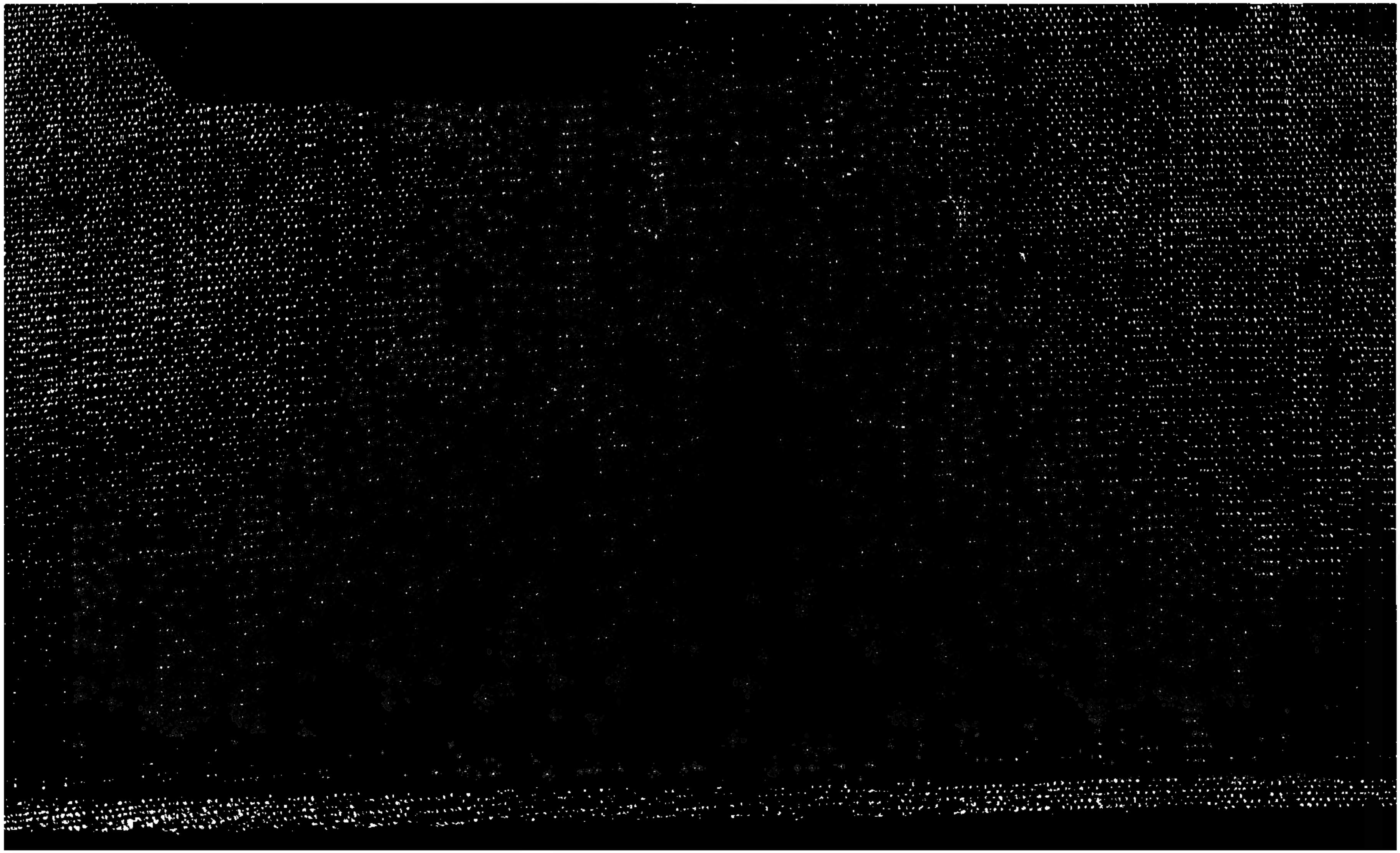

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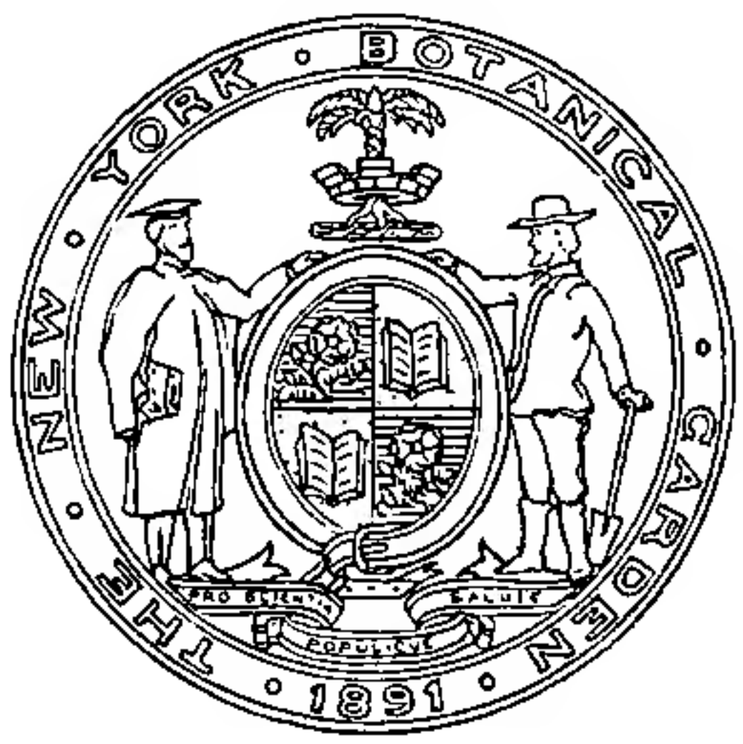
he New York Botanical Garden

EDITORS

MARSHALL A. HOWE

and

CAROL H. WOODWARD



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1936

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THE 1935 CHRYSANTHEMUM BORDER

Out of the labor of selecting, discarding, arranging, and re-arranging; and out of a mass of data on blooming dates, heights, colors and types collected over a period of two years, there evolved the hardy chrysanthemum border of 1935. Very little of this labor was, of course, apparent behind this striking display of color, but to the keen observer one fact was apparent: that was, that the health and vigor of the plants bespoke good cultural practice, and this was one of the main contributing factors in the great outdoor display. All the previous labor of selection and arrangement and the collecting of data would have been counteracted had this important phase been omitted, for the chrysanthemum as much as any other plant will respond readily to good culture, just as an absence of care will affect it adversely.

In treating of the chrysanthemum planting of 1935, it is only right that mention should be made of the soil treatment that resulted in a profusion of healthy, vigorous foliage that imparted substance to the bloom.

During 1934, which was the first year the border plan was adopted, the plants suffered severely from attacks of eel-worm, with which the soil was infested. These eel-worms, which are microscopic, were splashed on the leaves by rain or through watering with hose; infested leaves turned black and dropped off, many of the varieties being practically defoliated. It was noted that some varieties were more susceptible than others, and such were discarded.

The problem of eradicating the pest was attacked vigorously by Dr. B. O. Dodge, the pathologist of the Garden staff. Cuttings

were taken from clean plants and the old roots discarded. In the spring, about two weeks previous to planting, the soil in the border was treated with formaldehyde at a strength of 1:100, the soil having been previously dug up and well pulverized. The solution is usually applied at the rate of one-half gallon to every square foot of surface, and immediately covered with fresh uninfested soil, sacking, or old canvas, to hold in the gases for a few days. This treatment resulted in practically eliminating this pest and the subsequent effect on the health and vigor of the plants was apparent.

For convenience and proper effect, it was suggested that the varieties be divided up into two main groups, early and late varieties. This proved to be an excellent arrangement in many ways, particularly at blooming time, when it was seen that the gayest colors predominated in the early border, toning down in the late border to the more subdued shades of the darker bronzes, reds, and pinks, with a scarcity of the gay yellows that so characterized the early border.

The varieties, instead of being planted in separate blocks of color, were planted in bold groups and masses, blending and mingling into one another as in a perennial or annual border. This method proved very successful, for not only was the effect enhanced, but the varieties themselves showed up to better effect in their relation to each other, for they were planted with a definite color arrangement.

It might be thought that the very early and intermediate varieties would upset the arrangement and leave the border patchy, but such was not the case, for the records show that at most there never were more than three to five days between the blooming dates in the early planting of the different varieties, and much the same rate obtained in the late border also; in fact, it seemed as if the early border came into bloom overnight.

The early border itself was a study. Here we found the gayest of the chrysanthemums, and from whatever angle it was viewed it presented a different perspective, and then, too, as the season advanced, many of the varieties changed to darker hues, tending to alter the whole arrangement.

The late border, containing the darker and more subdued colors, more of the pinks, darker bronzes, and reds, required more white

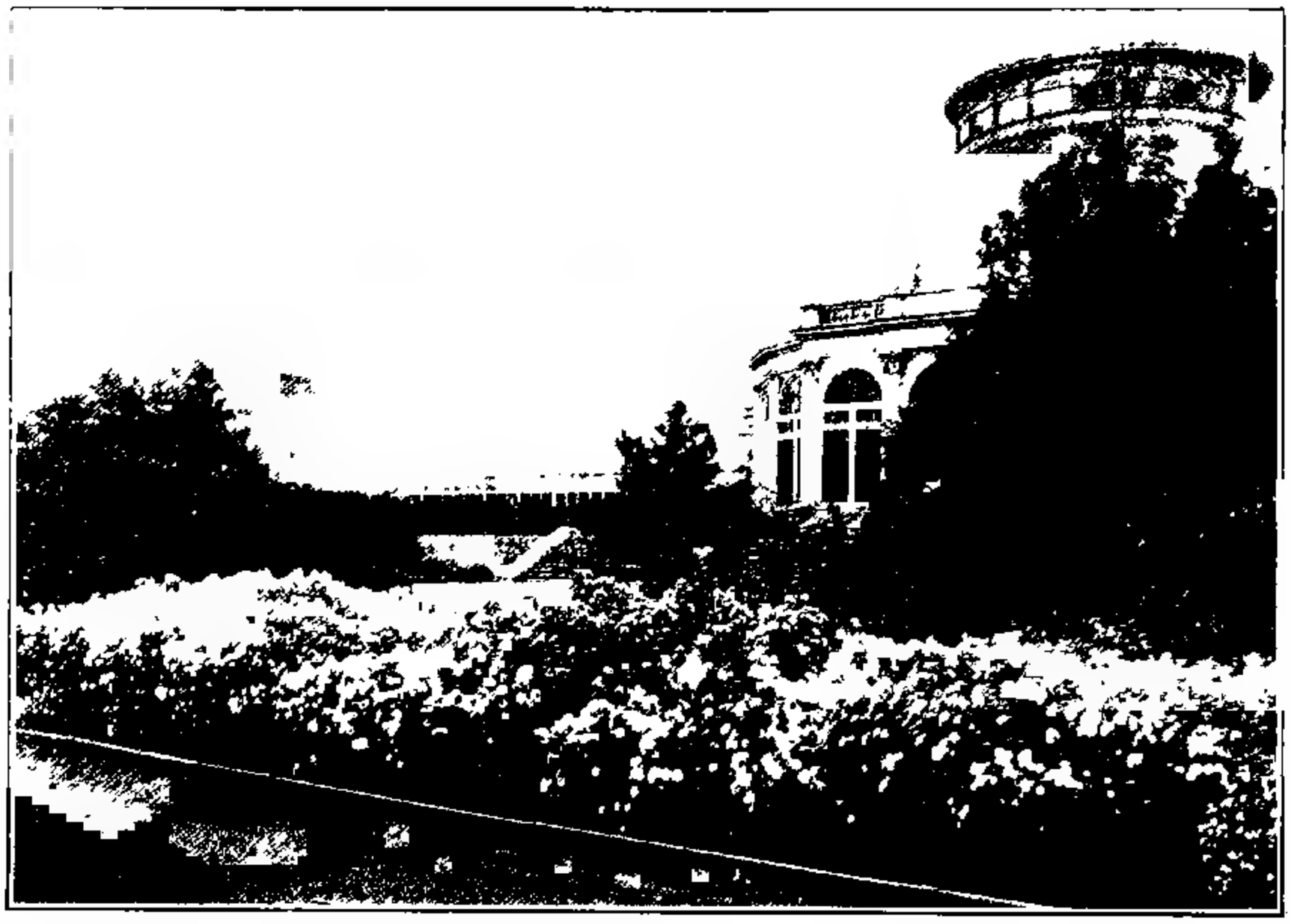

FIGURE 1. A portion of the early-blooming chrysanthemum border, north of Conservatory Range 1, in which brilliant yellows predominated.

to lighten the effect and give a tone of brightness to these dark colors.

It might be well to treat of some of the outstanding varieties and their characteristics, because only by taking into consideration the characters of the different types, was it possible to arrange and combine the whole into a definite scheme and at the same time permit them to retain their own individual charm.

Perhaps the most outstanding variety in the early border was Gretchen Piper, a large single flower of excellent substance, in color a good clear yellow; it seemed to dominate and light up the entire border. Growing about four and a half feet tall and being planted in a large bold group that extended from the rear to the front of the border and right in the center of it, this variety held a most advantageous position, and the flowers retained their color and form over a long period.

A variety that proved a little dangerous to use in a color scheme was Uvalda, a pompon. It opened up a good clear white but in a short time it turned a dark rose-pink and remained this way for

FIGURE 2. Gretchen Piper, one of the finest of flowers among the early chrysanthemums, its clear yellow blooms seeming to light up the entire border.

a long time. Care had to be exercised to keep it away from the reds and other pinks.

White Doty is a large creamy white pompon about four feet tall. It has great trusses of bloom and holds its color well over a long period. It needs careful staking as the large blooms become heavy, particularly when wet; this is a fine vigorous variety and easy to grow. Bronze Doty and Red Doty, two large pompons, the former about four and a half feet and a good shade of bronze, the latter about three and a half feet and a good dark red, are

two excellent varieties of good form and substance and exceptional vigor.

In the pinks, Caroline Robbins, a single; Ermalinda, a pompon; and Mrs. W. E. Buckingham, also a single, together with Mrs. Porter, a pompon, were varieties that stood well throughout the season; they average about three feet in height.

Mention should be made of the variety Captain Cook. This is a large pink pompon with a bronze center, almost four and a half feet tall. It was planted in a large group near the northeast end of the border and extended from the rear to the center. Next to it were planted Julia Quinlan, a tall yellow-bronze single, and a bright yellow pompon, Nuggets, with small flowers on stems about three feet long.

All of these varieties came into bloom between October 18 and 24.

In the late border, Molly Hunt, a large single, proved to be a good white that held its color well. White Diana, a pompon, is also a good clear white but perhaps not quite so hardy as the others; the blooms will suffer if a frost catches the opening buds, which will tend to disfigure the flowers.

White Midget is a pompon of good substance, about three and a half feet tall. The flower is very small and the plants could stand considerable pinching to make them branch.

Among the pink varieties, the old standby, California, a single about four feet tall and quite hardy, is still good. Bessie La Roche, Rose F. Ricci, and Helen Tait are also good varieties of pink, single in type. Rose F. Ricci is about five feet tall and needs careful staking and tying. Helen Tait is a darker pink than the first two mentioned.

Among the darker shades of old rose, the most suitable ones were Anna Kuhn, a pompon; Mary Hill, a large decorative type about four feet tall; and Barbara Cummings, also a pompon and an excellent subject for the front of the border, growing about two and a half feet high. Prince of Wales is a good large yellow pompon, about three and a half feet tall; it should be well staked.

It is interesting to note that the variety Becky McLane, a bronze pompon, came into bloom on November 27, when the temperature was at 23° F., with snow, and came through in perfect condition.

PATRICK J. MCKENNA.

FIGURE 3. Bronze tones, harmonizing with reds and golds, made the late flowering chrysanthemum border a pageant of autumn beauty.

AUTUMN COLORATION*

With the approach of autumn and winter, Nature stages one of her most colorful pageants—the display of autumnal colors in plant life. The lush tender leaves of the deciduous trees and shrubs, and of most of the herbaceous plants as well, die almost all at the same time. The green pigments which prevailed in these plants during the summer now quickly disappear and the foliage changes to yellow, red, orange or brown, either in clear colors or in various combinations. During this time individual leaves display rich coloring; single trees present brilliant effects; the landscape becomes a panorama of gorgeous hues; and the scenic effects are of remarkable and almost indescribable beauty.

Plant pigments affecting autumn coloring:—The principal plant pigments concerned in autumn coloring are the plastid or vegetable pigments, which occur in specialized masses of protoplasm within the cells, and the sap-soluble or ornamental pigments. The dominant plastid pigments in the active leaves during the summer are the chlorophylls that are either blue-black or dark-green. These play an important and direct role in the absorbing of light and in the manufacture of sugars.

It is believed that these chlorophyll pigments are both manufactured and decomposed quite continuously in connection with the building of sugars. The leaf remains green as long as new chlorophyll is made. But in the plastids of the cells there are also produced certain compounds called carotinoids which are simpler than chlorophyll in chemical composition and also less in quantity. Of these, carotin ($C_{40}H_{56}$) and its oxidation product xanthophyll ($C_{40}H_{56}O_2$) are pale yellow, brown, or sometimes red. In the dying leaves of many plants—the tulip-tree and many of the willows and poplars, for instance these carotinoids are present, and the chemical changes which they undergo after the chlorophyll is decomposed are responsible for the clear yellow that appears in these plants.

Most of the red, purple, and blue pigments in autumn coloring are sap-soluble materials known as anthocyanins. These are formed by chemical changes from the pale-yellow flavones, which are generally present in the plants that manufacture sugar and

* An address broadcast over Station WOR for the Radio Garden Club, sponsored by the New Jersey State College of Agriculture, October 11, 1935.

starch. In many species of green plants anthocyanin pigments are present in abundance throughout the life of the plant. Such plants often provide gayly colored foliage throughout their entire span of life and many of them are highly prized in horticulture as ornamentals during the summer season. In the garden beet also the rich red sap-pigments are present, and although they are more or less masked by the green in the leaves, they are abundant and conspicuous in the fleshy roots. In most of the green-leaved trees and shrubs which develop red colors in autumn, the pigments which give the colors are formed from the less conspicuous flavones. These anthocyanins show marked differences in color, ranging from scarlet to purple and blue, according to degrees and kinds of acidity and alkalinity.

The particular formation of pigments in any plant is, to a large degree, hereditary. Thus the red maple and the sour gum regularly give bright scarlet, while the ash and the sweet gum present purplish shades. The various species show marked specificity or hereditary determination in the manufacture of some one or more of the various pigments and in the development of the chemical reactions that are involved. Various degrees of mixture in the amounts and kinds of both the carotinoids and the anthocyanins, together with differences in acidity, are responsible for such variations in color as are seen in the sumach, the red oak, the sweet gum, the red maple, and the sugar maple. Also, the chemical changes are greatly influenced by such external conditions as light, temperature, and moisture. These conditions vary from year to year, or for plants of the same species growing in different places, or even for the various branches and leaves of a single plant.

Richly colored herbaceous plants:—Certain of the herbaceous plants are as richly colored in autumn as are the trees. For example, the foliage, stems, and ripe fruits of the pokeberry or inkberry become a brilliant scarlet and dark-red, while the leaves on certain of the milkweeds become golden-yellow. But, because of their lesser stature and a more limited number of leaves, herbaceous plants are less conspicuous in the landscape than are the trees. Among herbaceous plants the grasses probably excel in respect to noteworthy landscape effects. One beard grass grows in almost solid stands which cover many acres of upland fields and

hills about New York City. In autumn these grassy landscapes promptly change from green to rosy red, and these colors persist long after deciduous trees have shed their foliage. In fact, the coloring continues throughout the winter, but gradually changes from red to more subdued shades of pale yellow and brown. These grassy fields provide the most lasting of the scenic effects of autumn coloration.

The pigments which give gay color effects in plant tissues during autumn are chemically somewhat unstable, and the conditions in the dead leaves hasten further changes, especially in oxidation. Thus the leaves soon become brown and black. It is seldom that a white condition develops or at least lasts for any period of time. In various species the death of the leaves results in changes from green directly to brown or black.

Colors in flowers and fruits:—It may be noted that the same pigments and, in general, quite the same conditions, are involved in the developments of the colors in flowers and fruits. There is in these organs the loss or disappearance of chlorophyll, followed or accompanied by the color changes in plastid pigments, or in sap pigments, or there is a combination of both. These changes are associated with the internal regulations which take place during the maturing of flowers and fruits. In fruits, especially, the pigments seem more lasting than in dying leaves because the tissues remain alive, or at least more juicy, for a longer time. The same may be said for such gayly colored roots as the scarlet radish, the purple-topped turnip and the orange carrot. The range of colors in these organs duplicates the main colors seen in the autumn coloration of foliage.

Colors in evergreen leaves:—It may be noted that those leaves which stay over winter on various evergreens, such as yew, arborvitae and red cedar, become somewhat red during the winter months through chemical changes in the plastid pigments. Often these color changes are delicate and gradual. But when the leaves of the evergreens grow old and eventually die, there is usually considerable display of yellow and brown, as in pines and spruces, or of yellow, red, and brown, as in rhododendrons. The colors of such dying or dead leaves appear often in sharp contrast to the green of those that remain longer on the tree. Yet, even in the most conspicuous cases, as in the pines and spruces, the autumn

coloring is masked by the one or more crops of young leaves that remain. Hence it is in our deciduous trees, with their many broad leaves which change color almost in unison, that the most noticeable displays of color appear.

Geographical distribution of autumn coloration:—Many persons are somewhat surprised when they learn that autumn colors, such as those that prevail each fall about New York, occur over a relatively small portion of the land areas of the earth. Let us briefly consider the geographical distribution of autumn coloration. In general there are two main ecological types of deciduous trees and shrubs. For one type, the plants are green during a rainy season, but they drop their leaves with the approach of the dry season that follows. There are large areas of such forests or semi-forests located in the torrid zone. It is the rule that the leaves of such plants dry out in dying and do not develop gay colorings, as do the leaves of many trees about New York City during a protracted period of severe drought in summer.

Another type of deciduous forest is found in the temperate regions where there is a rather continuous supply of moisture but where low winter temperatures prevent continuous growth. We live in the midst of such an area. Here the climate provides two sharply contrasted seasons: there is a warm summer with an abundant and fairly continuous rainfall and this is followed by a cold winter with temperatures that hinder plant growth. The dominant vegetation of the area is composed of deciduous trees, shrubs, and vines, with areas of herbaceous meadows or swamps interspersed. In spring and summer, plant life quickly puts forth green leaves that are tender, lush, and short-lived. Often by the middle of summer the older leaves of various species, as the tulip tree and the sumach, have aged and completed their normal span of life; and their death is accompanied by a rich development of coloring. With the approach of still more unfavorable conditions for growth, the leaves of the other deciduous plants die and are shed. Meanwhile, the aerial parts of herbaceous perennials die, the annuals die completely, and such evergreens as are present drop one crop of leaves. In each there are the color changes characteristic of the species or race.

Climatic cycles:—The death and fall of leaves are to be viewed as adaptations in the modes of plant life to the repeated annual

cycles of climatic conditions. Year after year for ages the climatic cycle has occurred, and during this time plants have been forced to develop habits of living suited to this abrupt transition from favorable to unfavorable conditions. One result has been the evolution of plants which either die or drop their leaves with the approach of winter. Of these the deciduous forest is a dominant type of vegetation. The formation of these gayly colored pigments is associated with the chemical changes which accompany the death and fall of the leaves. The development of these by-product pigments appears to be purely incidental and it evidently serves no purpose of direct benefit to the plant itself.

But the area of deciduous temperate forests which give autumn coloration is indeed limited. In the southern hemisphere there is only one small area of this type of forest and this is located in the southern portion of South America. In the northern hemisphere there are three rather large but widely separated areas of these deciduous forests: one is in eastern Asia; one is in southwestern Europe with narrow extensions northward along the Atlantic Coast and eastward through south-central Europe; and one is in the eastern part of North America extending from the Gulf of St. Lawrence to Florida and westward through the Mississippi Valley to the Great Plains. A large part of the rest of the land area of the earth is covered with deserts, tropical rain forests, and coniferous evergreen forests, in all of which there are relatively slight seasonal changes in the aspects of the vegetation.

In the eastern portion of North America, as exemplified by the region about New York City, late summer and autumn bring shorter hours of daylight and low temperatures while there is a continued supply of moisture. The vegetation is composed of many species of deciduous trees and shrubs and of some herbaceous plants possessing pigments which will undergo those chemical changes that give conspicuous color effects. In autumn, clear sunny weather often prevails, promoting these chemical processes in the leaves. There is a combination of conditions which brings the pageant of autumn coloration to a degree of gorgeous perfection and beauty seen in few other geographical areas and nowhere excelled.

A. B. Stout.

12

THE VEGETATIVE PROPAGATION OF HIPPEASTRUMS AND CERTAIN OTHER AMARYLLIDS

Through the courtesy of Mr. Wyndham Hayward, President of the American Amaryllis Society, and Mr. I. W. Heaton of the Heaton Bulb and Palm Company, Orlando, Fla., I was recently afforded an opportunity to inspect the first large-scale commercial propagation of hybrid Hippeastrums undertaken by newly developed vegetative methods. Hippeastrum bulbs capable of producing high quality flowers have in the past commanded almost prohibitive prices, a circumstance mainly attributable to the slowness of their natural asexual increase.

For this reason good collections of choice Hippeastrums are limited in number and where they exist they are the result of a program of long years of careful breeding and rigorous selection of the seedlings. In private collections forms of exceptional merit have been increased slowly by means of offsets. For commercial purposes producers of Hippeastrum bulbs have depended upon seedlings and the stock so raised has been for the most part worse than mediocre. Grading for the market has been based entirely upon the size of the bulb rather than on the quality of the flower it was capable of producing. Now, with a rapid means available of increasing bulbs of proved worth, all this should be changed, and dealers should soon be able to offer named forms which will give flowers true to type in every respect.

A rapid method of securing increase of Hippeastrums vegetatively was first worked out by Miss Ida Luyten of Wageningen, Holland, and an account of her work was published in 1926. Miss Luyten's method consisted essentially of "scooping" the bulbs after the manner practised with hyacinths, then cutting them vertically and separating the scales, which were planted in a mixture of peat-moss and sand, and placed in a propagating case having a temperature of about 80° F. From the base of the scales the young bulbs are formed.

The method used by Mr. Heaton is a modification and in some respects a simplification of Miss Luyten's practice. He does not scoop out the base of the bulb but instead sections it vertically into from four to sixteen segments. Each of these segments is still further divided by splitting downward between the leaf-

FIGURE 1. Fractions of an amaryllis bulb being used in propagation, about eight months after planting, showing the bulblets appearing from between the leaf scales.

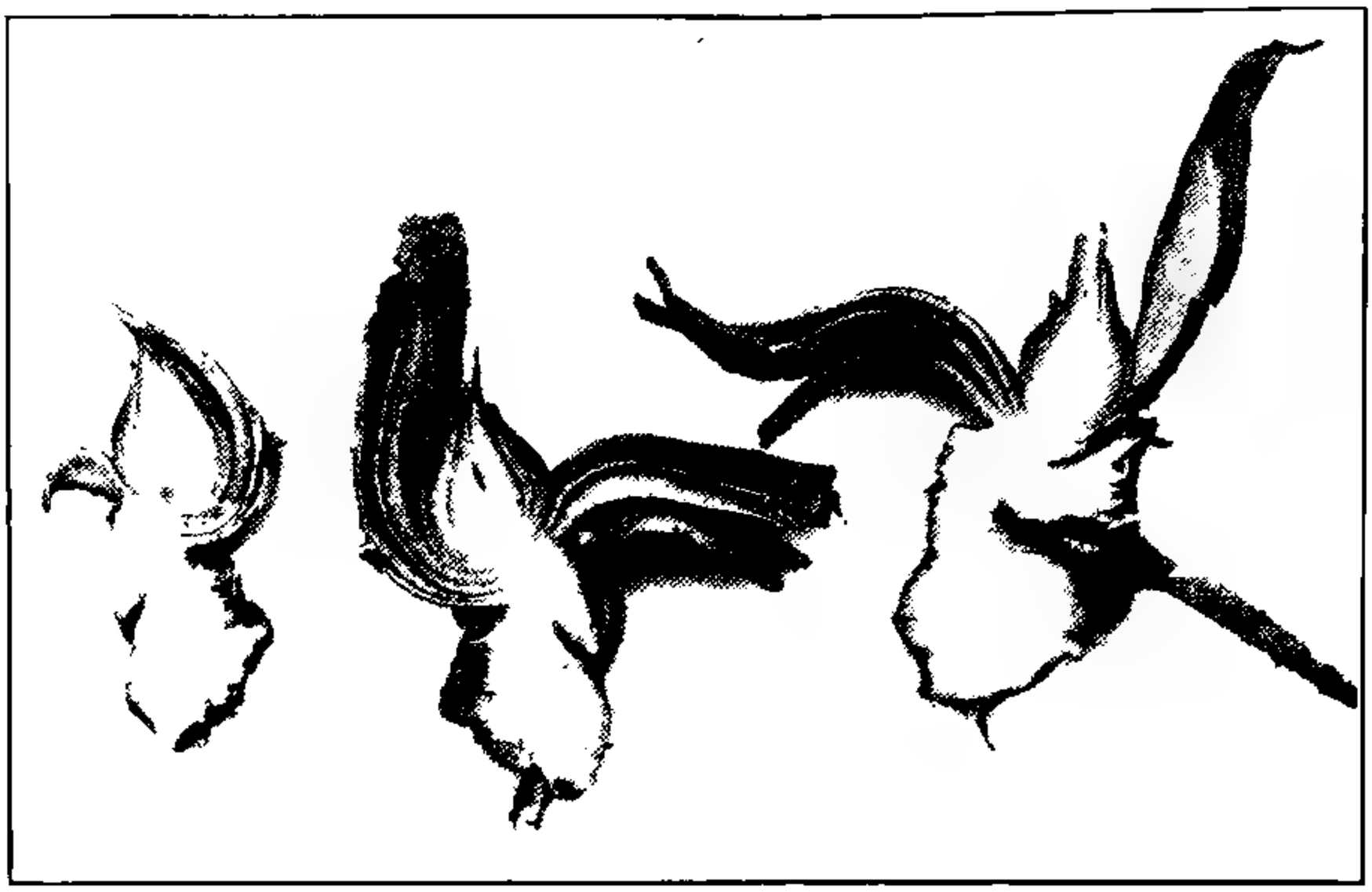

FIGURE 2. Sections of the same bulblets and scales, illustrating the stem origin of the bulblets.

scales and cutting through the base so that the final fractions consist of a portion of two or more leaf scales with a piece of the base or stem attached. From a single bulb Mr. Heaton cuts as many as sixty-four fractions and these are planted closely together in large flats in a mixture consisting basically of equal parts of peat-moss and sand. They are buried to about one half their depth and in the early stages watering is done with great care so that danger of loss from rotting is minimized. After about six weeks one, or occasionally more, bulblets will have formed between the scales and from the portion of stem which forms their base. These bulblets are apparently developed from dormant buds which are normally present in the axils of the scale-leaves. New roots which are produced from the stem portion assist in supplying the growing bulblet with moisture and food material.

From September to November has proved the most satisfactory period for cutting the bulbs, and young plants resulting from such propagation are ready for transplanting and treating in the manner of seedlings by the following February or March. As might be expected, Mr. Heaton has found that certain individual bulbs are capable of much more rapid propagation than others. He has also found that the best results are obtained when the rooting

mixture is decidedly alkaline, and to bring about this desirable condition he adds limestone and wood ashes to his mixture of sand and peat so that its alkalinity index value is raised to almost or quite pH8.

Other workers who have experimented in this field are Mr. Wyndham Hayward and Mr. Hamilton P. Traub of Florida and Mr. James Esson of Great Neck, Long Island. The photographs here reproduced were made from material supplied by Mr. Esson.

Experiment has abundantly proved that this method of propagation can be applied with equal success to *Narcissus, Crinum, Hymenocallis, Haemanthus,* and *Crinodonna,* and it is probable that other members of the Amaryllidaceae will respond to similar treatment.

T. H. EVERETT.

WITH OUR COLLABORATORS

Under the heading, *With Our Collaborators,* there will appear from time to time in the JOURNAL certain items of interest concerning our collaborators. These notes will contain excerpts from their letters as well as news concerning their collecting trips and the specimens which are sent to us.

It has been several months since any word has been received from Mr. Boris Krukoff. The last message came from Manaos, Brazil, and indicated that he was heading southwest, intending to collect in Bolivia south of the Abuná River beyond the reach of mail. This is Mr. Krukoff's sixth expedition into South America, particularly in the basin of the Amazon River. He has previously made collections in the states of Maranhão and Pará and in the Amazon Basin on the upper waters of the Tapajóz, Purús, Jurua and other rivers in western and southwestern Amazonas. Of the thousands of specimens which he has brought back, many enlarge the ranges of important South American plants and, in addition, more than one hundred new species have been collected.

* * *

Mr. Otto Degener reports from Hawaii that he has "acquired" a new assistant, a Filipino. He picked him up along the beach and dubbed him "Flotsam and Jetsam", not being able to make out his Ilocano name. It seems that "F. and J." was a man of

property for, when he reported for work, he brought along "one rooster and ten girl—he lay some time one day five eggs." Being a practical man, Mr. Degener bought them all at a dollar apiece, ate the rooster and gave the ten "girls" a home. Mr. Degener is hard at work on his *Flora Hawaiiensis,* of which two volumes of approximately 300 pages each have already been published.

* * *

An interesting letter has lately been received from South Africa, describing the collecting trip of Mr. R. H. N. Smithers into Namaqualand, Cape Province. The purpose of the expedition was to bring together a series of desert succulents for our living collection of South African plants here at New York. Several excerpts from this letter follow:

"Quite close by on another copje (near Springbok) was found *Euphorbia stellaespina.* It is interesting that, in discussing this plant with the schoolmaster, Mr. J. van Heerden, he tells me that while looking up references to the expedition sent by the Governor of the Cape, Simon van der Stel, it was recorded that they pitched camp near a copje covered with a spiny plant which they named 'stellaespina' in his honour. This expedition set out from the Cape about 1690-1691. I have often heard it said by authorities that the name means 'star-spine', but this seems even a better explanation and certainly a more romantic one."

Farther along in the letter it is noted:

"At Kuboos we made exhaustive enquiries as to where it was possible to find the *Pachypodium namaquanum* or 'half mense' as it is known to the Hottentots. Not one of them, however, seemed to know it, and although we searched thoroughly we could find no trace of it. This was very disappointing, as I had heard that they grew near Kuboos; however, we contented ourselves with the thought that probably we might find them further east nearer Viols Drift.

"Later when we made our way to Jackalswater (temp. 106° in the shade) we found an old Hottentot who for the promise of half a pound of tea said he could take us to the spot. I was rather frightened that we were being led on a wild goose chase and that probably when we got to the spot we would find *Aloe dichotoma* instead, but it turned out that he had understood my drawings better than I thought and sure enough brought us to the Pachypodiums. We had to take the car over the most dreadful ten miles of virgin stone veld experienced on the whole trip, at the end of which we had to climb some fifteen hundred feet over 'red hot' rocks before we got there, but the effort was well worth

Photo by R. H. N. Smithers

FIGURE 1. *Pachypodium namaquanum* Welw. "Half-man," Ouranoop, Namaqualand, Cape Province, South Africa.

while and I hope to be able to send one or two really good specimens. They only grow in the far north of Namaqualand and the southern part of southwest Africa and then only in small patches in the hottest driest places. They perch themselves usually on a broken down quartz reef just like a lot of men walking up the hill. The old Hottentot legend says that many years ago a strange people came to settle in their country but they all died; for each family a 'half mense' (half man) grew.

"They are very superstitious about them, and I don't wonder, seeing them as I did in the last few minutes of the evening light. Standing in line up the hillside, they seemed to be striving to break loose from some invisible force which was holding them back and I expected that at any moment one would take a step forward!

"Their heads follow the sun's course; the bend at the top is very noticeable in one of the photographs. (See FIG. 1.) Some specimens grow to eight or nine feet, the trunks at the bottom being ten or twelve inches in diameter.

"In 1927 the Gardens here planted some *Pachypodium* seed which germinated and is now showing three sets of spines. If

Photo by R. H. N. Smithers

FIGURE 2. Leaves and flowers of *Pachypodium namaquanum* Welw. (Apocynaceae).

this is any criterion, then a nine-foot specimen which has 360 rows should be 900 years old! As a general rule plants from the desert parts of the country grow much more quickly here in the Cape, but of course it sounds as if this may be an exception; however, the fact remains that they must be very long-lived plants."

Other excerpts from Mr. Smithers' letter concern many of the desert succulents collected on his expedition as well as interesting tales of encounters with horned adders, scorpions and delicious Hottentot stews made from mice, lizards and locusts.

W. H. CAMP.

A NEW BOOK ON POLLEN*

Dr. Wodehouse's comprehensive book on pollen will undoubtedly be of interest to many readers of the JOURNAL, not only because of its subject matter, but also because much of the material for his studies was secured from The New York Botanical Garden and the foundation of his work was laid in our laboratories. As the principal cause of hayfever, pollen grains are directly important to millions of people. From the standpoint of pure botany, pollen is also of great interest. These microscopic granules, although delicate in structure, are easily fossilized, and so perfectly do they preserve their structural features through untold thousands of years that they now afford one of the surest and most practicable means for discovering the nature of the vegetation of prehistoric times. Dr. Wodehouse has also succeeded in demonstrating that the varied shape, structure, and ornamentation of pollen grains is the result of definite evolutionary processes, so that they now constitute one other efficient source of evidence in determining the course of evolution and the probable ancestry of our existing plants.

Everyone knows of the necessity of pollen in the production of seeds. Formed in the stamens, it is transported, usually by wind or by insects, to the pistil, where it sets up a growth which ends in the fertilization of the egg cell and its further development into the embryo of a seed. This process does not lie within the scope of the book, but it is briefly mentioned.

The historical résumé discusses and illustrates, among other subjects, the Assyrian sculptures supposed to show the artificial pollination of the date palm. While the actual significance of these sculptures is doubtful, it is certain that artificial pollination was practised long before the rôle of pollen was even suspected by the scientist.

An inspection of the plates shows at once the intricate but geometrical pattern of the ridges, spines, and furrows with which most pollen grains are covered. These are so constant for each kind of plant that analytical keys may be made for the identification of plants from their pollen. The nature of these patterns is

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* Pollen grains, their structure, identification and significance in science and medicine. By R. P. Wodehouse. pp. xv.+ 574, 14 plates and 123 text figures. McGraw-Hill Book Company, New York. 1935. $6.

fixed by certain mathematical-physical laws, which the author discusses in detail on the basis of his own original research. Following this discussion more than half the book is devoted to a description of the pollen of many kinds of plants, and special attention has been given to those which cause hayfever. One chapter discusses the method of mounting and staining pollen for microscopic study.

The author has had long experience with hayfever and discusses this unpleasant malady in a chapter of eighteen pages. Hayfever of early spring is usually caused by the pollen of trees. Birch, willow, elm, poplar, and oak are all offenders. In early summer grasses are the prevailing source of hayfever pollen, and the worst of them are sweet vernal grass, orchard grass, timothy, redtop, and June grass. The last is the commonest lawn grass in our eastern states. Fortunate it is indeed for hayfever patients that our lawns are kept mowed so that pollen is not produced in quantity. Strangely, the numerous grasses which bloom in late summer and autumn are of little importance in hayfever.

Later in the summer and in early autumn ragweeds are the chief cause of hayfever. They are abundant in the eastern states and produce large quantities of wind-borne pollen. In the western states their place is taken by other closely related plants. The goldenrod, so often suspected, is exonerated by the author.

Hayfever is treated by the proper administration of pollen-extracts and the method of collecting pollen for their preparation is described. The author is careful to warn his readers against any attempt at diagnosis or treatment of this disease except by a competent physician.

Never before have the cause, the development, and the evolution of pollen-structures been presented in so complete a manner. Never before has the structure of pollen grains been described in such a comprehensive way. In a bibliography of twelve pages the important pollen-literature of the world is cited. In all these features the author has done a real and highly important service to botanical science and the medical profession.

The publishers also deserve praise for their typographic skill and especially for their excellent reproduction of the author's admirable illustrations.

H. A. Gleason.

ROGERS' FLOWERS OF TREES IN BOOK FORM*

Visitors at the Botanical Garden a year ago were delighted to find in the lobby of the Museum Building a large display of photographs of tree flowers, made with remarkable skill by Dr. Walter E. Rogers, Professor of Botany at Lawrence College, Appleton, Wis.

Most trees produce small and inconspicuous flowers, but these photographs, enlarged to many times natural size, showed that such flowers are exquisite miniatures in their structure, possessing a beauty of form and symmetry equal to that of our choicest garden ornaments.

These enlarged photographs have now been combined with others by Dr. Rogers in an entrancing book, illustrating flowers of more than 100 trees. Primarily it is a picture-book according to the author's intent, a book in which many hitherto unseen tree-flowers become for the spectator objects of wonder and of genuine beauty. Facing each illustration are a few brief paragraphs of text—not technical descriptions, but interesting facts, simply told, about each flower and the tree that bears it. Ornamenting the page are small silhouettes of the flowers, buds, leaves, branches, or other noteworthy features, and these are preceded by a winter silhouette of each tree whose flowers are pictured. Drawings are made by Olga A. Smith, Instructor in Botany at Lawrence College.

For many years, every American possessed of a love of nature and an eye for its often unobserved beauties, has admired the books that have come from other countries—especially from Germany—through which nature photography deservedly has assumed a place among the fine arts. Professor Rogers' work is one of the first of such volumes to appear exclusively as an American product.

Although designed primarily as a work of art, the book is by no means without value to the botanist. The detailed illustration of such small flowers as elm, willow, and maple, on a scale several times natural size, gives an impression of their morphology quite different from that conveyed by the customary pen and ink drawings. The book should be of great value as a reference work in the teaching of systematic botany and dendrology.

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*Rogers, Walter E. Tree Flowers of Forest, Park, and Street. 500 pages. Published by the author, Appleton, Wis., 1935. $5.50.

To open the cover means to turn page after page in amazed delight and to find satisfaction in lingering over the photographs. The author has earned the thanks of the botanical and horticultural public for a new idea in publication. Let us hope that the book is followed by a second volume devoted to similar illustrations of the small-flowered herbaceous plants.

H. A. GLEASON.

NEW GARDENING BOOKS FROM AMERICA AND ENGLAND

Among recent publications of interest to gardeners, two are so typical of the countries where they originated that they deserve comparison with each other. One, an American book done by two landscape architects who seem to have an exceptionally wide knowledge of plant material, is written for those Americans who would like a fine border of flowers blooming harmoniously from spring to fall, but who still have a great deal to learn about general gardening practices.

The other, done by that type of keen amateur gardener so familiar in British horticultural circles, but which, in America, despite our garden clubs, is unfortunately still a rarity, will be enjoyed only by those who have a thorough understanding of plants. To them, every page will be a delight; to others, mere meaningless words.

ON HOW TO CREATE A FINE BORDER[1]

Using their years of experience in designing and maintaining flower borders as an important feature of both landscaping and gardening, Messrs. Ortloff and Raymore, who have already given serious gardeners a number of excellent books, tell in their latest volume how to create a border which will fit the particular picture desired on each property. First, they advise prospective gardeners to visit other gardens, looking at them with an analytical eye and carrying home those ideas which can be applied to their own grounds, then they offer simple designs, photographs of successful borders, and descriptive lists of different types of plants for both border and background. Plants are conveniently

[1] Ortloff, H. Stewart, and Raymore, Henry B., Color and succession of bloom in the flower border. 256 pages, illustrated. Doubleday-Doran, New York, 1935. $2.50.

classified as to their season of bloom, color, and the type of soil and amount of sunlight they prefer. Also, lists are given for the different climatic regions of the United States. The varieties might not be everyone's choice, but as a whole good reliable kinds are suggested, and the nomenclature (based on Standardized Plant Names) is generally up to date and correct in spelling. The few errors, such as *Uginea* for *Urginea, coelstinum* for *coelestinum,* and *conspicuous* for *conspicuus* as a varietal name, appear to be merely typographical—still they are not to be condoned, but perhaps forgiven.

Especially to be commended is the chapter on color, which though it verges on the scientific in terminology, evolves into a readable and very practical discussion of how to use and how *not* to combine certain colors in the border.

Rare Plants In An English Garden[2]

Sir Arthur F. Hort's book presupposes considerable knowledge of gardening and of the rarer plant materials. As an amateur gardener, Sir Arthur has written for the British horticultural press, and has produced an earlier book, "The Unconventional Garden." The present volume, a posthumous publication, was completed and edited by Lady Hort.

The style is pleasantly intimate—offering little to one who opens the book to seek classified information. His small garden is described, one season at a time (beginning with "The Winter of Content"), somewhat in reflective mood, yet offering to the reader ample material for horticultural thought. Every page, in fact, is replete with information about choice plants for gardens—cultural, historical, botanical, ethnological, interspersed with personal experiences—the result of many years of acquiring and raising and studying fine plants.

When we read about several garden flowers appearing in February, we realize that the cultural directions given must be greatly tempered for all American growers outside of the far northwestern states. Nevertheless, for those who know plants and gardening thoroughly, and who are, therefore, ever alert for greater knowledge, the book makes pleasant, informative, often tantalizing reading.

Carol H. Woodward.

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[2] **Hort, Sir** Arthur F., Garden variety. 255 pages. Edward Arnold & Co., London, 1935. (Distributed by Longmans-Green, New York.) $4.20.

A GLANCE AT CURRENT LITERATURE*

Oak trees of New England are treated by S. N. F. Sanford in the October *Bulletin* of the Boston Society of Natural History. Photographs of twelve acorns are shown, leaf-outlines are depicted, and a key and descriptions are included.

* * *

For those who wish to plant hardy lilies, *Horticulture* gives directions in tabular form in the October 15 issue. Size, color and flowering date of 32 kinds are listed, followed by date and proper depth of planting.

* * *

Summarizing the work of Dr. L. O. Kunkel, the *Florists' Exchange* of October 19 describes the aster yellows disease and the latest discovered measures for its control.

* * *

Four hundred weeds which occur in New York State are listed by W. C. Muenscher in *Bulletin 635* of the Cornell University Agricultural Experiment Station. A useful list of publications for further reference on these plants and their control is appended.

* * *

Biologists and horticulturists both should find J. G. Leach's article in *The Botanical Review* for November of interest and importance. He writes on "Insects in Relation to Plant Diseases."

* * *

The genus *Anemone* is being monographed serially, beginning in the November 30 number of *The Gardeners' Chronicle*. Similar treatment of *Pulsatilla* and *Hepatica* are to follow.

* * *

The interest of European gardeners in our native goldenrods is well illustrated in *The Gardeners' Chronicle* for December 7, in which a handsome panicle of flowers, described as soft yellow, is shown above the name *Solidago Leraft*. It is said to be a hybrid of *S. missouriensis,* and to have appeared in the trade as "*Aster luteus.*"

* * *

Species of *Cyclamen,* especially *C. europaeum* and *C. neapolitanum,* are treated by P. J. Van Melle in his series, "Seeking Out the Best" in the *Florists' Exchange* for December 14. The

* All publications mentioned here—and many others—may be found in the Library of The New York Botanical Garden, in the Museum Building.

following week he discusses Campanulas, emphasizing the importance of forms of desirable species.

* * *

"Poisonous Plants of Pennsylvania" is the title of a new general bulletin, No. 531, issued by the Pennsylvania Department of Agriculture. While plants poisonous to human beings are included, emphasis is placed on those which are injurious to farm animals.

* * *

Colorado alpines are described by Stuart Boothman in the October *Journal* of the Royal Horticultural Society. Among the plants from above the 10,000-foot line on Pike's Peak which are found to be hardy in Great Britain are *Lewisia rediviva, Calochortus Gunnisoni, Eritrichium argenteum, Oenothera* and *Townsendia* species and, most prized of all, *Boykinia Jamesii.*

* * *

Imposing photographs of fossil plants from Idaho and Oregon. made by Dr. Stanley T. Brooks, with descriptions of species by Betty Watt Brooks occupy volume 34 of the *Annals* of the Carnegie Museum, issued last summer. The several hundred specimens shown were collected some years ago by Horton C. Hinshaw.

* * *

Poisonous Euphorbiae are the subject of Leon Croizat in *Desert Plant Life* for November. The author deals particularly with a plant that has recently appeared in the news columns in connection with the current war in Ethiopia. Forrest Shreve describes a desert by the sea (in Lower California) and J. R. Brown gives several interesting notes on Haworthias.

* * *

The garden of Mrs. Augustine Henry in Dublin, containing Chinese plants which her famous explorer-husband collected and plants which bear his name, is described in *The Gardener's Chronicle* of November 9. Among the plants growing there, for instance, are *Itea ilicifolia* and *Viburnum Henryi.*

* * *

The *Breeze Hill News* for November records the extremely late blooming of *Lilium (philippense) formosanum,* and gives cultural directions for this hardy six-footer with delicately tinted white flowers.

A new publication from the western coast has appeared, called *The Garden Quarterly*. Illustrated in color, it makes an impressive appeal, but one who reads to the end becomes a bit suspicious of its reliability, when an article signed by one of the editors states: "Peat moss is indeed the gardener's friend. It never fails, it never betrays, and it always makes plants grow better." Experience at the Botanical Garden has not revealed such universal perfection for this much-advertised product.

CAROL H. WOODWARD.

NOTES, NEWS, AND COMMENT

Albert Spear Hitchcock, the eminent American agrostologist, died of heart failure December 16, 1935, on board the City of Norfolk, returning from Europe. He attended the International Botanical Congress at Amsterdam as a delegate and remained to study the grasses in various herbaria, visiting Leiden, Utrecht, Brussels, Paris, Geneva, Berlin, London, Cambridge, and Oxford.

Dr. Hitchcock was born in Michigan September 4, 1865, grew up in Kansas and Nebraska, and attended Iowa State College, where he received his bachelor's, master's, and doctor's degrees. After about 13 years of teaching he became agrostologist in the United States Department of Agriculture in 1901. Besides traveling throughout the U. S., he carried on botanical exploration from Alaska to Chile, Labrador to British Guiana, the West Indies, Hawaii, the Philippines, Japan, China, and Indo-China. In 1929 he was invited by the British Association for the Advancement of Science and the South African Association for the Advancement of Science, to attend the joint meetings in Cape Town and Johannesburg. After the meetings and official excursions he botanized in Kenya and Uganda. He was the author of a large number of works on grasses, the latest being "Manual of Grasses of the United States," an illustrated volume of 1,040 pages, published in 1935.

Dr. Hitchcock had recently undertaken the completion of the Grass Family for *North American Flora*, and two parts of his authorship appeared in 1935. He was in his seventy-first year, and had been retired only three months from active service.

Dr. A. C. Smith, who had been abroad since attending the Sixth International Botanic Congress in Amsterdam in Septem-

ber, returned to the Garden early in December. He has been working at Kew on identification of the plants he collected during the year he recently spent in Fiji. A paper to be published by the Bishop Museum in Honolulu describes eighty new species from his collection.

Dr. A. L. Carrion, who is in charge of the study of fungous diseases of humans at the School of Tropical Medicine of Columbia University in San Juan, Porto Rico, did some additional research at the Garden while in New York last month.

The Monthly Conference of the Scientific Staff and Registered Students of the Garden was addressed in December by Miss Carol H. Woodward, who described gardens she studied while in Europe last spring and summer, emphasizing American plants and native plants of the countries visited which were in frequent use in the gardens there.

Dr. Glen Gardner Hahn of Harvard University recently spent a day in the Mycological Herbarium looking over specimens of some of the lower fungi preparatory to a monograph on which he has been working for some time in collaboration with The New York Botanical Garden.

Dr. Fred Jay Seaver was appointed one of two representatives from the Mycological Society of America to serve on the Council of the American Association for the Advancement of Science at the annual meeting in St. Louis.

A United Press dispatch from Capetown, South Africa, on December 26, reported that Table Mountain, which overlooks Capetown, was ablaze from end to end. Aviators reported that the glow could be seen 140 miles away, and it was thought the fire would continue for a week. A second dispatch on December 27, however, reported that the fire, after burning through the previous day and night, had been extinguished unexpectedly by heavy rains, after destroying $1,500,000 worth of pine timber. In view of the number of rare and endemic plants on Table Mountain, continuance of this fire would have been a major botanical catastrophe—as it may be, even now. Further news is awaited from botanists in that region as to just how much was destroyed.

Plants which have been pressed and preserved in their natural colors were exhibited in the Museum Building at the Garden late in October, and are being shown again in January. The process

which thus holds their color and cell-structure over a number of years is the development of Mr. G. Russell Fessenden, an amateur botanist of Mt. Vernon, N. Y., who has worked many years on a formula for "fresh" preservation of plants because of his personal interest in preventing the fading and shriveling of pressed specimens. The subjects have been preserved by a series of special treatments followed by impregnation with an inert colloidal compound which keeps out all air and moisture. The specimens are mounted between sheets of cellulose film to protect them from mechanical injury.

Both treatment and formula for the impregnating compound are varied for individual adaptation to the chemical characteristics of each species or variety. The material proves useful both for botanical study and for wall decoration.

The following visiting botanists registered in the library during the autumn: Dr. Gertrude S. Burlingham, Newfane, Vt, and Mr. Carl T. Ramsey, Dorset, Vt., Dr. E. D. Merrill, Dr. David H. Linder, and Messrs. Milton Hopkins and Stuart K. Harris, Cambridge, Mass., Mr. Don B. Creager, Forest Hills, Mass., Dr. Paul R. Burkholder, New London, Conn., Professor Alexander Evans, New Haven, Conn., Mr. Warren E. Bristol, Hartford, Conn., Prof. L. H. Bailey and Messrs. B. T. Clausen and M. C. Richards, Ithaca, N. Y., Col. J. E. Spingarn, Amenia, N. Y., Dr. Conway Zirkle, Philadelphia, Pa., Mr. Herbert A. Wahl, State College, Pa., Dr. T. D. Howe, Pittsburgh, Pa., Mr. Willard W. Eggleston, Washington, D. C., Dr. and Mrs. L. R. Jones, Madison, Wisc., Miss Edith Aldis, Hutchinson, Kans., Miss Alice Eastwood and Mr. J. T. Howell, San Francisco, Cal., Mr. John B. Angel, St. John's Newfoundland, Dr. Rafael A. Toro, University of Puerto Rico, Mr. L. B. Mandelson, Brisbane, Australia, and Prof. W. Y. Chun, Canton, China.

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Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

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Greenhouses, containing thousands of interesting plants from America and foreign countries.

Flower shows throughout the year—in the spring, summer, and autumn displays of daffodils, lilacs, irises, peonies, roses, water-lilies, dahlias, and chrysanthemums; in the winter, displays of greenhouse-blooming plants.

A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants; also historic microscopes.

An herbarium, comprising more than 1,800,000 specimens of American and foreign species.

Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

Scientific research in laboratories and in the field into the diversified problems of plant life.

A library of botanical and horticultural literature, comprising nearly 45,000 books and numerous pamphlets.

Public lectures on a great variety of botanical topics, continuing throughout the autumn, winter and spring.

Publications on botanical subjects, partly of technical, scientific, and partly of popular, interest.

The education of school children and the public through the above features and the giving of free information on botanical, horticultural and forestral subjects.

The Garden is dependent upon an annual appropriation by the City of New York, private benefactions, and membership fees. Applications for membership are always welcome. The classes of membership are:

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NOTES, NEWS, AND COMMENT

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NOTES ON SOME BACTERIAL AND FUNGOUS DISEASES IN OUR GARDENS

In discussing various types of diseases of ornamental plants with students of the Science Course for Professional Gardeners recently, it was found convenient to group diseases together according to the causal agent. We found, for example, that gardeners and nurserymen are frequently concerned with some fifteen different diseases of ornamental plants caused by bacteria alone. These diseases can be subdivided more or less conveniently according to the way the organism over-winters or according to the methods recommended for their control.

Among the bacterial diseases of ornamentals in many gardens, we are now finding that the old pear-blight (fire-blight) disease is becoming established on hawthorns, flowering crabs, and other ornamentals of the apple group, such as the shadbush, quince, and mountain-ash. The burned end-branches show conspicuously during the summer. This disease can not be controlled by spraying, but it can be materially reduced by cutting out holdover cankers and by severely pruning back the infected branches early in the spring.

There is also a similar black twig-blight of lilacs that is caused by another bacterial organism. The leaves turn brown or blackish in spots which soon involve the whole leaf. The disease attacks especially young growth and runs down the tip branches bringing about a blackish twig-blight. Here again pruning back the infected branches with shears that have been dipped in a formaldehyde solution so as not to spread the disease is recommended, or spraying the bushes with a standard Bordeaux mixture helps to prevent further spread.

In contrast to this type of bacterial disease we have the streak of sweet peas. Here reddish-brown streaks appear on stems,

petioles, leaves, and pods. It seems that the bacterial organism is carried on old plant parts and on the seed; therefore that it is advisable to burn all such refuse and to sterilize the seed before planting. White recommends that the seed be treated with a 5 per cent commercial formaldehyde solution for about five minutes, as this will also control anthracnose.

Nasturtium and dahlia wilt diseases are both caused by the same species of bacterium. Dahlias may also wilt from the work of the cane borer or from attacks of soil fungi. One recognizes the bacterial wilt by the blackish appearance of the inside of the stalk and by the fact that when the stalk is cut or broken one sees masses of bacterial ooze which are not present in the other cases.

The writer recently described in the JOURNAL[1] a case of blight of *Delphinium Ajacis*, a disease distinct from delphinium blacks, which is a local leaf-disease caused by another species of bacterium. In each case two or three thorough sprayings of the soil as well as the young diseased plants with standard Bordeaux mixture has been found to be very helpful.

Gladiolus neck-rot or scab is well known to gardeners, as is the bacterial leaf-disease of this plant. In these cases it is recommended to treat the corms with a solution of corrosive sublimate 1:1000 for an hour or so, first removing the husks, which are apt to carry the disease.

The leaf-spot bacterial diseases of pelargonium and carnation are easily recognized from the small brownish spots, usually bordered with water-soaked areas. Both diseases are prevalent in houses that are not well ventilated or where the plants are set too close together and water is splashed from a diseased plant to healthy plants. Both diseases can be controlled by changing the cultural methods, setting the plants farther apart and regulating the ventilation and avoiding splashing water from one plant to another.

In addition to the black bacterial twig-blight of lilac mentioned above, there is a brownish twig-blight of lilac, also a die-back disease of rhododendron, which are both caused by a species of fungus closely related to the fungus causing the root-rot of calla, described below, and both are in the same genus (*Phytophthora*) as that causing the late blight of potatoes.

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[1] Dodge, B. O. A bacterial disease of Delphinium Ajacis. Jour. N. Y. Bot. Gard. **36**: 257-260. 1935.

FIGURE 1. The corm-like rhizome of a calla which has become infected with Phytophthora root-rot. Only a few healthy roots remain, and even these are rotted at the tip.

The twig-blight and die-back are controlled by pruning out the affected branches or tips, while the potato blight is controlled by successive sprayings with Bordeaux mixture. The third species, which infests calla, involves rhizome-treatment and soil- and pot-sterilization. These three examples show that each disease is a special problem requiring specific treatment regardless of the close relationship of the causal organisms.

We have two or three bacterial rot diseases, such as the hyacinth yellow rot and the calla soft rot. Both are rather destructive diseases once they become established. The calla soft rot is often present along with a fungous disease discovered in Europe about 1927 and recently introduced into the United States.

This fungous disease of calla was described by Weiss[2] soon after it was first discovered in this country. His report was followed by other notes by Chester,[3] Tilford,[4] and White.[5] They compare the bacterial rhizome-rot with the fungous root-rot trouble and recommend methods for their control. They have pointed out that the bacterial soft rot affects the base of the stalk or the top of the rhizome, causing a soft brownish foul-smelling rot, which causes affected plants to topple over.

During the winter of 1933, Mr. T. H. Everett, our horticulturist, called attention to a disease that was appearing in a new calla planting. He had about fifty potted plants that were nearly full grown and ready to bloom. Here and there leaves would begin to turn yellowish and fall down. New leaves that developed soon became affected the same way. The flower spathes that opened were dull-colored when they appeared and soon turned brown. In most cases the spathes did not open. As the disease seemed to be spreading rapidly, the whole lot was discarded except a few plants which were reserved for further study.

It was found that plants showing the disease most seriously had very few solid feeding roots, most of the others being so badly decayed as to show only an outer shell. (FIGURE 1). New roots

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[2] Weiss, F. A root rot of the white calla new in the United States. Florists Exchange **73**[16]: 11, 13. 19 Ap. 1930.

[3] Chester, K. S. The Phytophthora disease of calla in America. Jour. Arnold Arboretum 11: 169-171. 1930.

[4] Tilford, Paul E. Calla lily root rot and its control. Ohio Agr. Exp. Sta. Bull. **157**: 138-140. *fig.* 1. 1932.

[5] White, R. P. Control of calla diseases. New Jersey Agr. Exp. Sta. Nursery disease notes 5: 1-4. 1933.

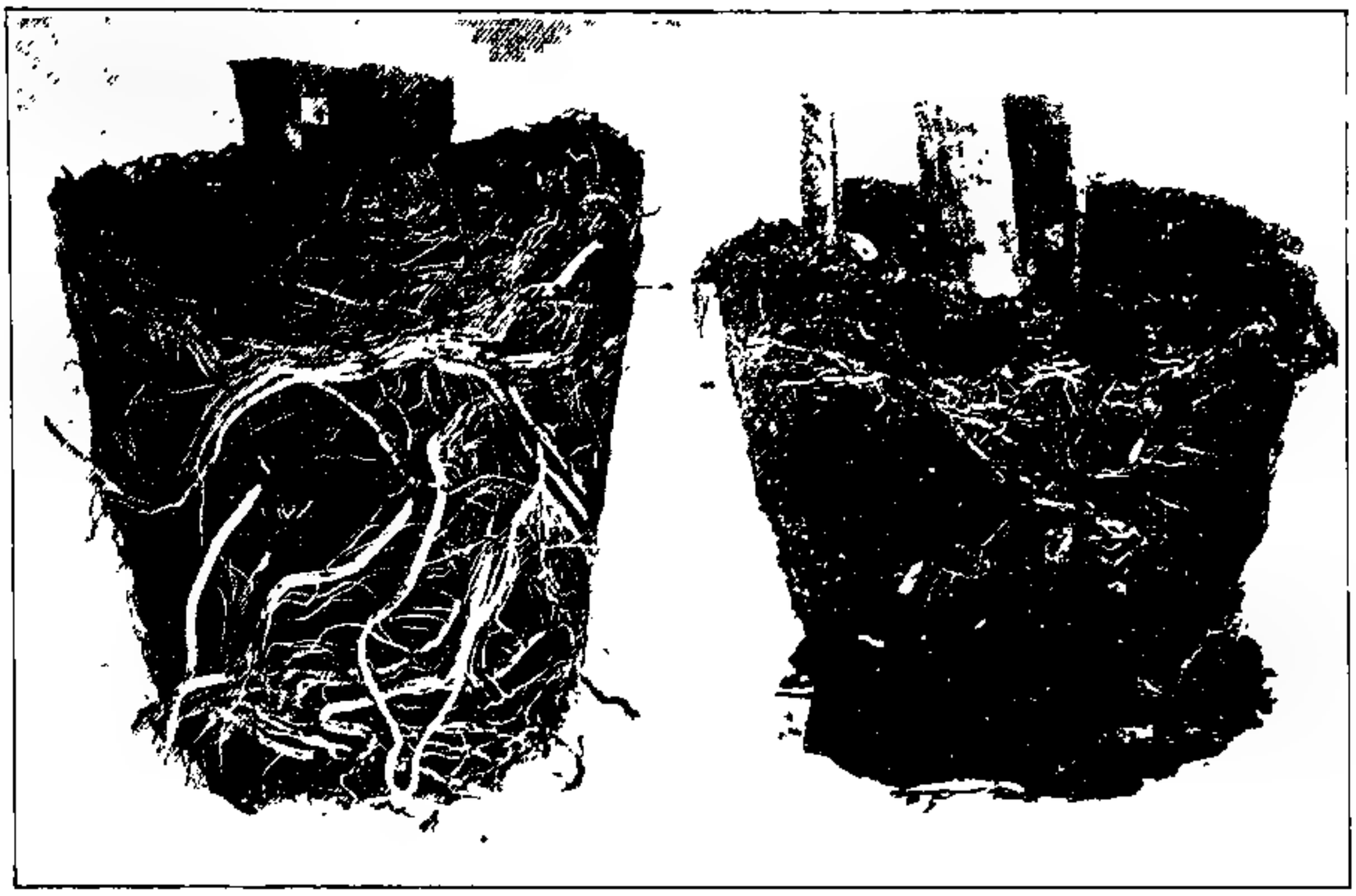

FIGURE 2. Root-mass of a healthy calla, at the left, in contrast to the brown and decayed roots of a plant infected with the bacterial root-rot which is described here.

were being put out but their tip ends would soon begin to show the same rot. FIGURE 2 shows the rotted root-system of a plant that was still surviving, as compared with a healthy root-system.

As the fungus (*Phytophthora Ricardiae*) causing the disease is carried over in the soil and in the rotted calla roots, control, according to the authors cited, is possible if, before planting, rhizomes are sterilized. First all rotted parts should be cut away and the rhizomes should be washed about 15 minutes in running water. They are then immersed in a 1:50 solution of commercial formaldehyde for one hour. Some recommend a 1:1000 solution of corrosive sublimate for two or three hours. If the baterial soft rot is also present the time is increased somewhat. If the diseased callas have been grown in benches the soil should be removed and the benches sterilized. In case the plants have been grown in pots, the old pots should be soaked in a solution of formaldehyde 1:20 until they are thoroughly sterilized before being used again. Gardeners often make the mistake of dumping the discarded soil on a compost heat. This is bad practice in case of either a fungous disease or eel-worm troubles, as such organisms live for a long time in this soil.

B. O. DODGE.

BEGONIA SEMPERFLORENS VAR. INDIANERIN

Begonia semperflorens var. *indianerin* first came to my notice in August, 1934, when I saw a group of well-grown pot plants in full bloom at the Royal Botanic Gardens at Kew, England. This variety of the common Wax Begonia is remarkable because of its richly colored foliage which provides an excellent background for the light red flowers. The exact color of the leaves is difficult to describe—to say they are of a purplish-chocolate hue fails to convey any sense of the depth and beauty of their coloring or of the lustre they possess, and yet this hyphenated term perhaps most nearly describes their appearance.

In 1935 two beds located near Conservatory Range 1 were planted with this begonia and throughout the summer they made a good showing. From these plants cuttings were taken in early August and these produced well-furnished plants in five-inch pots in bloom for Christmas. *Begonia semperflorens* var. *indianerin* is

The shining dark leaves of *Begonia semperflorens* var. *indianerin* commend it for use as an outdoor bedding plant, also as a pot-plant indoors.

a distinct advance over other varieties in this group and should become popular as its merits become more widely known. It was introduced by Benary of Erfurt, Germany.

T. H. Everett.

THE WATER-HYACINTH A TIME-CLOCK

The common water-hyacinth is a very handsome plant with a very bad reputation. Its foliage and inflorescence are of the first order of beauty, but its method and rapidity of growth are often a liability.

This water-plant, *Piaropus crassipes,* was discovered in the San Francisco River, near Malhada, Brazil, and described in 1824 under the botanical name *Pontederia crassipes.* It has also been associated with the genus *Eichhornia.* It was soon found to be rather widely distributed in the New World tropics. Whether this wide range represented the natural distribution or was the result of the plant's being carried from one place to another by man after the discovery of America, does not seem clear.

About three decades ago this plant appeared in lower waters of the St. John's River in Florida. The plant multiplied so rapidly that it seemed destined to choke completely the channels of the river. Various remedies for removing the growth and preventing its accumulating again have been proposed and tried, without much success. Various accounts were extant concerning its introduction into Florida. About this time Lake Okeechobee was made readily accessible. The shores of the lake and its islands and tributaries were found to have a very luxuriant growth of the water-hyacinth. Whether this plant was native there, that is, introduced at some previous time through natural distribution, or carried there by man will always be a mystery. About that time the natural and artificial water courses of peninsular Florida were greatly disturbed by dredging and draining and artificial canals were dug through many sections. Soon the hyacinth appeared in various streams and lakes. New channels between lakes and rivers and through the Everglades spread this plant in all directions in the peninsula. Canals connected with the coast carried the plant seaward and it was not an uncommon sight to see patches or floating islands in the ocean, the growth soon killed, of course, by the salt water.

FIGURE 1. Close view of water-hyacinth, *Piaropus crassipes*, along the shore of Lake Okeechobee, Florida. The buds remain closed until about 7:30 in the morning.

FIGURE 2. Close view in the same patch of water-hyacinth as shown in FIGURE 1. The pale-lilac flowers open about 8 o'clock in the morning and remain open until evening.

The most luxuriant growth we have seen was in Lake Okeechobee and surrounding territory. Instead of the small leaf ordinarily seen in pools and even in many natural habitats, leaves a foot and a half to two feet high were common.

There we found the flowers had a definite time schedule. On an ordinary clear morning the flower buds appear as unopened tubes up to 7:30; before 8 o'clock they suddenly expand into the open cup-like perianths. See FIGURES 1 and 2.

The water-hyacinth has many outstanding characteristics. It reproduces sexually and propagates vegetatively with equal facility. Its growth is remarkably rapid and dense. It will grow in pure colonies or it will allow various other plants the freedom of close association with it, without crowding them out. The plants grow both rooted in the mud and free-floating with numerous long roots and myriad rootlets through which the luxuriant aerial parts of the plant are generously supported. Floating islands are thus formed, a few square feet to an acre in extent. The structure of these floating islands is dense enough not only to support themselves but other kinds of plants as well, but not solid enough to support the weight of a man. The water-hyacinth is a friendly plant and on these floating islands, shifted here and there by winds and currents, may be seen ferns, grasses, sedges, orchids, and still higher plants. The peculiar fern, *Thelypteris gongylodes*, often inhabits these islands. The lower monocots are made prominent by the arrowheads (*Sagittaria latifolia* and *S. lancifolia*). The most common grass is the maiden-cane (*Panicum hemitomum*). Sedges of various sizes float with the vegetable islands, the smaller ones being the spike-rushes (*Eleocharis*), the larger ones represented by a galingale (*Cyperus LeContei*). Sometimes the whip-like scapes of the great-bulrush (*Scirpus validus*) rise above the other plants on the floats. A common orchid frequently found in the tangled masses of vegetation is the tropical long-spur orchid (*Habenaria repens*), while a more unusual one is the rose-colored orchid (*Pogonia ophioglossoides*). Among the floating dicots may be seen smartweeds (*Persicaria*) and more showy plants, such as the Carolina aster (*Aster carolinianus*) and the bur-marigold (*Bidens mitis*).

This aquatic has long been known in Florida, as recorded above. Its existence there is often referred to in the daily papers in connection with its obstruction or fancied obstruction to navigation.

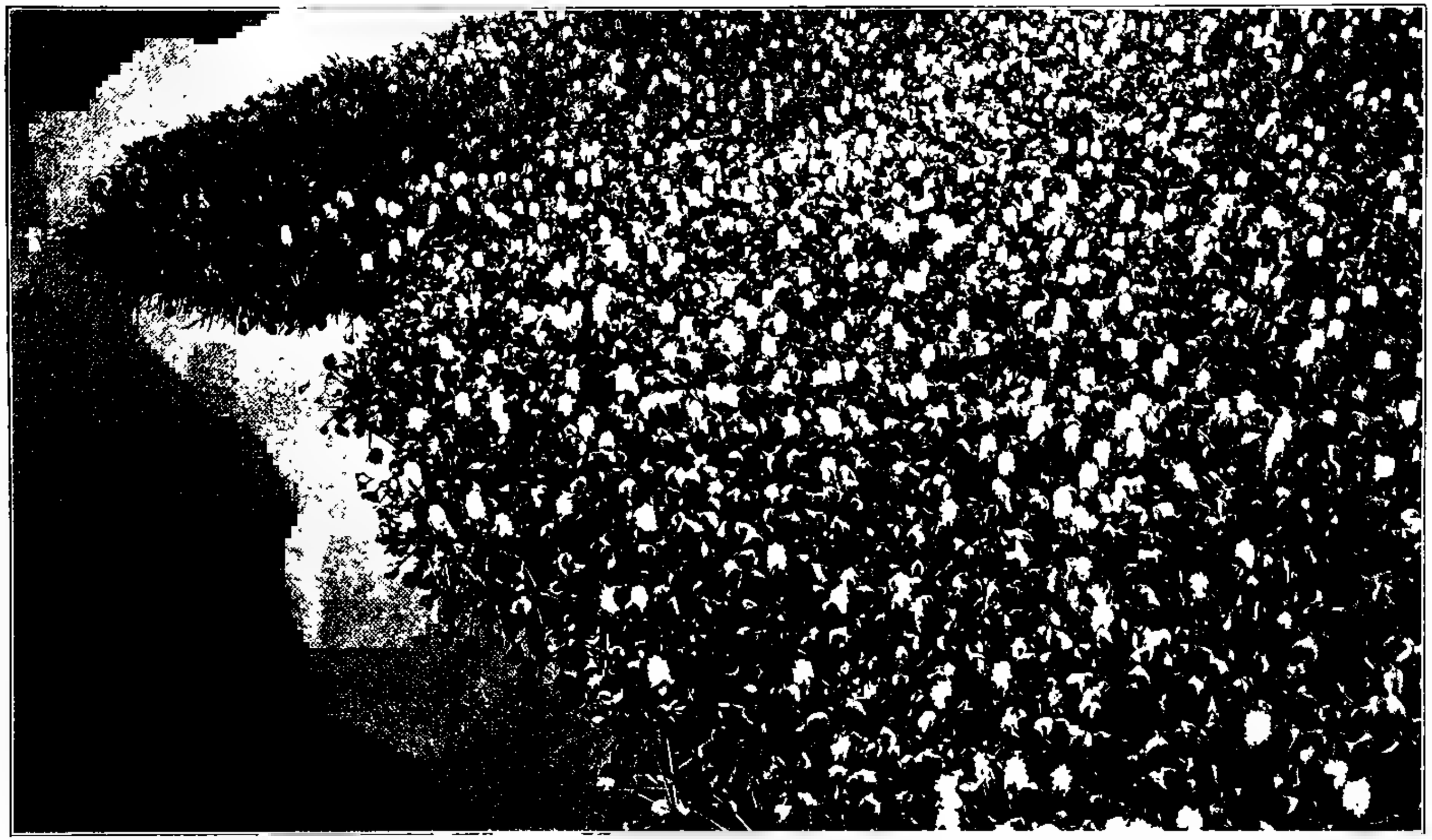

FIGURE 3. A small patch of water-hyacinth in Lake Tsala-Apopka, Florida. This aquatic assemblage of plants has become a floating island. A patch of maiden-cane grass may be seen on the projecting part at the left.

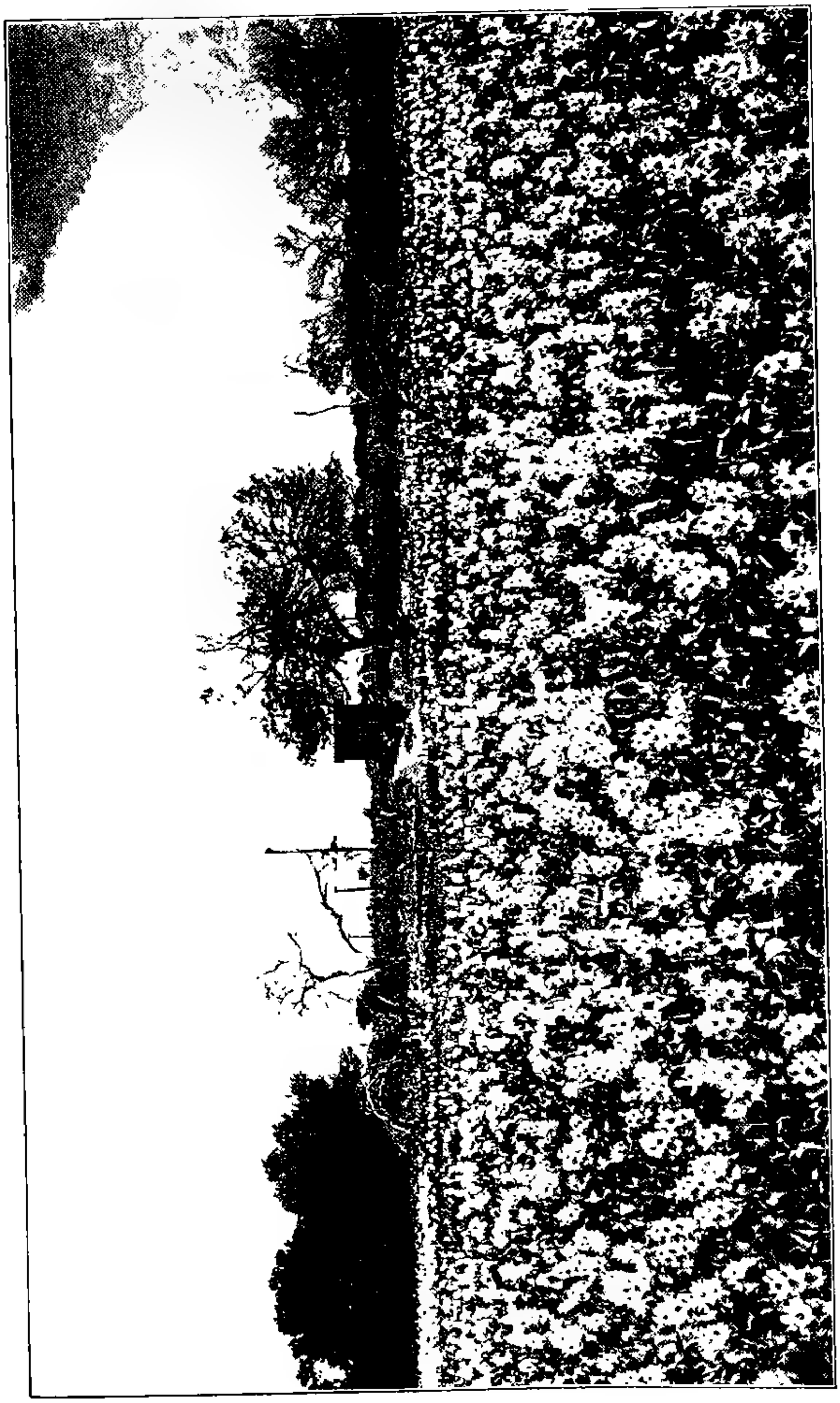

FIGURE 4. A large patch of water-hyacinth in the Resaca de la Palma, near Brownsville, Texas. The growth here is almost pure. It is called "campazos" by the Mexicans.

We seldom even hear of its existence in Texas, but, it is there in the Rio Grande Valley, where it grows as luxuriantly as it does in peninsular Florida. Examples of the growth in these two states are shown in FIGURES 3 and 4.

Even less frequent are reports of the plant from the other Gulf States. However, it has established itself in the coastal regions of Alabama, Mississippi, and Louisiana. In the latter state it has finally made itself completely at home, especially in the lower part of the delta south of the latitude of New Orleans. There it grows intimately with other aquatics, such as its close relative, the pickerel-weed (*Pontederia cordata*), bulrush (*Scirpus validus*), water-lily (*Castalia odorata*), bur-reed (*Sparganium americanum*), and yellow-cups (*Jussiaca diffusa*). The water-hyacinth and the chaff-flower (*Achyranthes philoxeroides*) often choke the bayous so thoroughly that dipper-dredges must be resorted to in order to clear the channels.

The water-hyacinth has also adopted southeastern Asia for a home.

JOHN K. SMALL.

1935 YEAR-BOOK OF THE AMARYLLIS SOCIETY

The 1935 year-book of the American Amaryllis Society represents an achievement of which any organization devoted to the cultivation of a special group of plants might well be proud. Considered as the second number of a publication of an infant society comprising less than 200 members, it is especially praiseworthy and reflects great credit on the editor and his able assistants.

This second volume is dedicated to Theodore L. Mead, one of the pioneer cultivators and breeders of Hippeastrums in America. Consisting of 161 pages, it includes an autobiography of Mr. Mead, the constitution and by-laws of the society, and many informative articles relating to Amaryllids, their classification and culture. Of special interest is "Vegetative Propagation of Hippeastrums" by Miss Ida Luyten; also a shorter article by Hamilton P Traub on the "Propagation of Amaryllids by Stem Cuttage."

The year-book is furnished to members of the society, annual dues in which are two dollars. Wyndham Hayward of Winter Park, Florida, is Secretary. E. G. Duckworth of Orlando, Florida, is President.

T. H. EVERETT.

42

AN UNSOUGHT ADVENTURE IN THE SOUTHERN CATSKILLS

That trips for botanical study do not always turn out successfully is not generally admitted, but one participant in such a trip has here decided to give to the light of day the story of a complete fiasco. The passing of nine years has tempered the memory of what was originally planned as a seed-collecting trip to the high peaks of the southern Catskills, so that the incidents now stand forth in their really humorous light.

Most people familiar with the Catskill Mountains might not consider a November trip over the well-known Wittenberg-Cornell-Slide Trail an appealing adventure, especially so when one thinks of the great staircase-like cliffs of Wittenberg, which are badly broken up by great cracks that would be concealed by the snow and where a misstep might mean a broken bone.

The two of us who took the trip had left our camp in the Hudson Highlands, where no winter chill had yet set in, and, unmindful of the greater elevation, had only taken a single army blanket apiece for cover, intending to sleep in the open on the summit of Slide Mountain that night. A noticeable chill became more and more apparent as we traveled north to Kingston, but when the farmer who gave us a lift into Phoenicia asked us where we were heading, and upon being told, said, "Boys, she's white," we were somewhat taken aback, but kept up a cheerful front to avoid being ridiculed. As we approached Phoenicia, some of the lower peaks came into view and even they were already white. We looked at each other, but silence was still the order of the day. Provisioning up with chocolate, bacon, and coffee, and investing in woolen gloves, we struck out up Woodland Valley and soon were enjoying the apples from roadside trees. We left the road and, wading the icy waters of Woodland Creek, started up the trail. Winter silence had fallen on the great forest of birch, beech, and maple and on two adventurers likewise, who now devoted all their energies to the steeply ascending, stony trail. Occasional stops were made, however, to examine a few colonies of *Hepatica*, both the sharp-lobed and round-lobed sorts, and to gather seed of *Pyrola*, hobble-bush, moosewood, and wake-robin. The dried and sere stalks of the summer's bloom were much in evidence, reminders of the past season's display when various goldenrods, asters, white snakeroot, horse-mint, *Habenaria*, and

FIGURE 1. Balsam, spruce and birch on the summit of Wittenberg Mountain were mantled in hoarfrost after the season's first cold snap in early November.

many others had been in their prime. Dried leaves of ferns were even more plentiful, for this region is well supplied with lady-fern, New York fern, the tender shield-ferns and the Osmundas Still in their greenery however, were polypody, Christmas-fern, and marginal and spinulose shield-ferns. In the hemlock forest on the lower shoulder of Wittenberg we sought in vain among the colonies of mountain sorrel for seed. As we emerged from the forest to the open ledge area, we came to the snow-line, here a mere ground-covering. From this plateau, we looked up to where, eight hundred feet above us, Wittenberg's lopsided nightcap of a summit cone, sheeted in snow and ice, seemed far away indeed. Stopping first to examine the fruit-laden branches of mountain holly and mountain ash around us, and to collect some, we turned to the business of reaching the cliff-girdled and fir-barbed, and at present ice-guarded, summit. We saw quantities of the red berries of the painted trillium in the woods here, but left most of them for the birds, likewise the yew-berries, for we had chocolate on deck, far more warming for a winter climb.

Here we found our first colonies of the large-leaved goldenrod, which descends very little, if at all, below three thousand feet in this section. The staircase-like cliffs were all we had expected of them, the snow-concealed and ice-edged crevices called for careful watch as to footing, but the heavy growth of fir and balsam was a shield from the icy winds we could hear whistling over the tree-tops.

Occasionally we kicked through the snow to where we knew patches of creeping snowberry were growing, and enjoyed the pleasant wintergreen flavor as a thirst quencher. Always mingled with the snowberry were plants of goldthread, but all seed was scattered. Near the summit we went out a short side-trail to the only spring in that section, and the water was so icy cold that we were gasping for breath after the first swallow; thereafter we resorted to icicles for water, as they seemed warmer. We stopped for a good rest on the summit and watched the sun just setting over the distant shoulder of Peekamoose, then down to the notch and up the summit ledges of Cornell we shinned, and into the finest forest of virgin spruce in New York State, which covers the top and westerly shoulder of this mountain. The forest floor here is deeply buried in moss with occasional ferns, trilliums, creeping snowberry, and in moist spots golden saxifrage.

On the way we collected a few berries of *Clintonia,* noting their black color, but little dreaming we had found the only recorded colony of *C. umbellulata* in the Local Area. By this time the sun had completely set, the sky being all red with its afterglow, and the entire forest around us, buried deep in snow and sheathed in hoarfrost, gave back a radiantly rosy reflection that seemed like fairyland come true. Our spirits rose—we sang—and the rose-tinted forest echoed what must have been the strangest and most discordant sounds it had ever heard. This hubbub came to an abrupt halt when we came out on the western ledge of the mountain overhanging Cornell Notch, and under which one swings at arm's length to descend. From this ledge, the first view of Slide Mountain is obtained, its great humpbacked bulk filling the entire view, and the way up looks long indeed by twilight. At the foot of the cliff we stopped long enough to gather berries of the twisted-stalk, which is plentiful in this notch, but when we reached the bottom of the notch, even twilight failed us, and in the darkness, an icy north wind swept through, bringing with it a fresh

FIGURE 2. The summit ledge of Slide Mountain was not the warmest place to pose, although the coralline trees were worth admiring.

snowfall. Soon chilled to the bone, we sought the shelter of the first spruce thicket we came to, and there attempted to start a fire to warm our fingers, to which the gloves had so frozen they could not be removed. The snow-sodden wood refused to burn, so we pulled out a few candles we had thoughtfully brought along and, lighting them, thawed out our nearly frozen fingers with the melting wax.

Starting the steep ascent, we found it necessary in places where the ice-sheeted cliffs offered no foothold, to boost and pull one another up. Finally we emerged onto the little clearing that marks the summit of Slide, with its east-facing cliff in which is sunken a bronze plate, a memorial to John Burroughs. Here we had intended to sleep, but after a look back over the valley of Esopus Creek—or where the valley would be, were it not now hidden beneath a veil of snow and mist, we slowly and frozenly went down the western slope into the Winnisook Valley, where we finally persuaded for ourselves a shelter for the few remaining hours of the night.

The next morning dawned brilliantly clear and cold, so back to the summit of Slide we went to take pictures. There we saw a different sort of fairyland. Every tree, bush and dead stalk was sheathed in hoarfrost crystals two to three inches long, the whole appearing coralline, until the sunlight caused crystalline reflections that sparkled like diamonds. Beneath these white coats, we knew, were concealed scrub oak, birch, and balsam, and we knew also that the dead stalks were those of large-leaved goldenrod, mountain aster, painted trillium and bottle gentian, and seeking beneath the snow, we found quantities of bunchberry, the bright red fruit-clusters still intact. Our pictures obtained, we descended the snow-drifted Curtis-Ormsbee trail to the valley of the Neversink, collecting along the way a few remaining seeds of withe-rod and hobble-bush. Our intention was to work up the stream-bed to Donovan's Brook and from there climb to Peekamoose by way of Table Mountain. This plan was carried out to a certain extent —first we worked our way up the Neversink and then up Donovan's Brook until we came to the first outliers of the spruce forest. Here, before going further, we took stock of the weather. The sky had become completely overcast, and flurries of snow began. The snow mist was fast descending the mountain, and realizing the impossibility of ascending an untrailed peak under such conditions, we turned back downstream, and just at dusk reached the first inhabited farmhouse whose occupants were home, and here obtained shelter for the night. That this move was a wise one was proved the next morning, when even the valley was buried in snow.

E. J. ALEXANDER.

WITH OUR COLLABORATORS

An interesting collection has been received from Mr. Floyd Bartley and Mr. Leslie W. Pontious, who have been among the most active collectors in Ohio in recent years. They have turned up a large number of plants new to the state, including a new species of grass (*Calamagrostis inspcrata* Swallen). Lately they have been concentrating their efforts on Liberty Township, Jackson County, Ohio, and hope to bring out a Flora of this region in the near future. They have chosen an extremely interesting area for intensive study, an area which, apparently, was but little dis-

turbed by the Pleistocene glaciation, for in the deep sandstone gorges and coves along Rocky Fork,. many plants distinctly southern in distribution (such as *Magnolia tripetala* and *M. macrophylla*) have been discovered. One of the pleasant memories of the writer is his first meeting with these two collectors. It was on a trip into this region with the lichenologist, John Wolf, that we came across them sitting under an Umbrella-tree, arguing over a *Carex*.

* * *

Work has been progressing on the collection of Mr. John B. Angel made in the summer of 1935 during the cruise of the schooner *Morrisey*—Capt. Robert Bartlett, Master—along the west coast of Greenland as far north as Inglefield Gulf. A small but important collection was also made on Cobourg Island in the Arctic Archipelago at the mouth of Jones Sound, 76° N. Latitude.

W. H. Camp.

REPORTS FROM ST. LOUIS MEETING OF A.A.A.S.

Botanical activities at the St. Louis meeting of the American Association for the Advancement of Science were reviewed by Dr. Fred Jay Seaver, Dr. B. O. Dodge, and Dr. H. A. Gleason at the January conference of the Scientific Staff and Registered Students of the Garden.

Repeating, in brief, his report on the financial status of *Mycologia*, Dr. Seaver revealed that the income during the last three years, since it became the official organ of the Mycological Society of America, had been $13,176, nearly half of the total income from 1925 to 1935. Of this amount, $5,728 was received during 1935—$3,646 of which came from subscriptions, $1,082 from the sale of the 24-year index, and $1,000 from an anonymous gift. It was thus possible during these three years to add $2,500 to the permanent *Mycologia* restricted endowment fund.

Dr. Dodge, the retiring president of the Mycological Society, and retiring vice-president of Section G (Botany) of the A.A.A.S., spoke especially of the symposium on "The Promise of Modern Botany for Human Welfare" which was arranged by Dr. E. W Sinnott and presented before a joint session of the two groups. Frederick D. Richey of the United States Bureau of Plant Indus-

try spoke on "The Botanist as a Creator"; E. C. Stakman of the University of Minnesota on "The Botanist as a Protector"; and George T. Moore of the Missouri Botanical Garden on "The Botanist as a Cultivator."

Because of the greatly increased interest in systematic botany, a movement was started, Dr. Gleason reported, to organize a systematic society. To outline plans for the group, a committee of seven was appointed, consisting of LeRoy Abrams of Leland Stanford University; P. A. Munz, Pomona College; Aven Nelson, University of Wyoming; N. C. Fassett, University of Wisconsin; E. E. Sherff, Chicago Normal College; F. W. Pennell, Philadelphia Academy of Science, and H. A. Gleason, New York Botanical Garden.

C. Stuart Gager, Director of the Brooklyn Botanic Garden, was elected President of the Botanical Society of America in St. Louis; H. A. Gleason, Vice-president, and F. E. Denny of the Boyce Thompson Institute, Treasurer.

A GLANCE AT CURRENT LITERATURE*

The latest issue of *Addisonia* (Volume 19, No. 2) contains an unusually interesting group of colored plates. The subjects include *Azalea arborescens,* the tree-azalea of the southern Appalachians; *Billbergia macrocalyx,* one of the showy epiphytes of the Pineapple Family; *Spiranthes odorata,* a fragrant ladies'-tresses of southeastern United States; *Boltonia latisquama,* a sturdy, pink-flowered native Composite for garden use; *Callistemon speciosus,* one of the brilliant red bottle-brushes from Australia; *Calochortus albus,* appropriately called "fairy lanterns"; *Silene virginica,* the fire-pink of the eastern states; and *Robinia ambigua,* a pink-flowered hybrid locust.

* * *

"Scrophulariaceae of Eastern Temperate North America" is the title of Monograph No. 1 of The Academy of Natural Sciences of Philadelphia. Francis W. Pennell, formerly Associate Curator at The New York Botanical Garden, is the author. Including the index, the work covers 650 pages.

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* All publications mentioned here—and many others—may be found in the Library of The New York Botanical Garden, in the Museum Building.

Studies on the frenching of tobacco are presented in the December number of *Phytopathology*. This, says the author, Ernest L. Spencer, is "one of the most puzzling of the so-called physiological diseases of tobacco." Though tobacco was then still a fairly new crop, this disease was first mentioned in print in 1688.

* * *

The proceedings of the annual meeting of the Eleventh National Shade Tree Conference which took place in Philadelphia August 28-30, are now available in book form. The Dutch elm-disease situation is given prominence in the report, and considerable space is devoted to tree cavities and their treatment.

* * *

The numerous American friends of the late Dr. John Briquet will be pleased to know that his biography has recently been published.* Briquet, respected for his ability and beloved for his character and personality, was not only a botanist of international reputation but a prominent and useful citizen in his service to Geneva and to Switzerland. His daughter has compiled the story of his life in a very readable little book, illustrated with several photographs.

* * *

The finest among the dahlias of recent introduction are appraised by Derrill W. Hart in an extensive presentation in *The Flower Grower* for December.

* * *

The Christmas number of *American Forests* is worthy of a place on everyone's library table, where the magnificent photographs of trees in winter can be frequently enjoyed.

* * *

Common-sense reviews of some of the 1935 gardening books are given by Mrs. Jay Clark, Jr., in the November *Bulletin* of the Garden Club of America. "Desert Wild Flowers of California", "The Great Smokies a Giant Rock Garden", and "Alpines and Rock Plants of the Central Rockies" are among other papers of special interest in this number.

* * *

Plants which were injured at the Arnold Arboretum by last winter's severe weather are listed, with comments, in the insti

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* Copies may be obtained from the Herbarium, Muséum d'Histoire Naturelle, Rue Cuvier, Paris 5e, for ten francs (about 65 cents).

tution's *Bulletin of Popular Information,* November 18. The issue of November 25 deals with the injurious effects of winter winds.

* * *

"Herbalists of 1936" by an unidentified writer in the *Florists Exchange* for January 4 flays the "name-changing botanists," declaring that some common names, such as "Japanese Quince," for what is now "*Chaenomeles japonica,* which used to be *Cydonia japonica*—which used to be *Pyrus japonica*"—are often more stationary than scientific names. The attack has aroused a volley of responses, in many of which the horticulturists are taking the botanists' side. One response levels a criticism against those nurserymen who rename familiar plants to give the impression of novelty and thus sell at a higher price, pointing out that the work of the botanists is a valiant effort to reduce the confusion of the jumbled state of nomenclature that existed in the nineteenth century.

* * *

"Orchids for Amateurs," in *The Orchid Review* for January, a reprint of a radio address by Charles H. Curtis, given last fall in Great Britain, gives the names of six orchids which, the author says, anyone can grow. He gives simple cultural directions for each. He also suggests using hardy native orchids under suitable conditions in the garden, but advises procuring them from dealers, giving warning that 95 per cent of those dug by amateurs are known to die unless given expert attention and a perfect situation.

* * *

A remarkable lady-slipper, *Cypripedium japonicum,* with large, deeply ribbed, fan-shaped leaves, is described in *The Gardeners' Chronicle* for January 4. Although seldom seen, it is said to be hardy and easy to grow if given a cool soil of equal parts sand, peat, and humus.

* * *

The 1935 dahlia season at The New York Botanical Garden and the native wild dahlias from Mexico, one of which bloomed at the Garden last fall from seed sent from Mexico by Miss Marian Storm, are features of the *Bulletin of the American Dahlia Society* for November.

New hybrid Korean chrysanthemums to grace the autumn garden are described by R. Marion Hatton in *Horticulture* for January 15.

* * *

The first volume of *The Botanical Review,* which was completed with the December number, contains twenty-four articles on such varied topics as L. O. Kunkel's "Possibilities in Plant Virus Classification," Helen Bancroft's "A Review of Researches Concerning Floral Morphology," J. Pavillard's "The Present Status of the Plant Association," M. Demerec's "Unstable Genes," and Walter Stiles' "Respiration." Other subjects treated during the year include plant diseases, cytology, structure of protoplasm, genetics of bryophytes, and life history of the Rhodophyceae.

CAROL H. WOODWARD.

NOTES, NEWS, AND COMMENT

The Gunnar Seidenfaden collection of Arctic plants has recently been acquired by the Botanical Garden. This collection consists of more than 1,300 sheets of carefully annotated specimens from the Faëroes, Iceland, East and West Greenland and the Arctic Archipelago, and contains fine series of plants showing the variations in the different localities. It is probable that many of the species in East Greenland persisted in local unglaciated areas during the early Pleistocene and are remnants of an earlier migration from Europe. The flora of the Arctic Archipelago and North Greenland seems to have been derived post-glacially mainly from the west, and in part from the south. The Seidenfaden collection fills in many of our gaps in Arctic distribution and further is important because many of the specimens have been cited in recent monographs of Arctic phytogeography.

Daffodils are to be given special attention in this country, through the formation on January 6 of the American Daffodil Society. Richardson Wright was elected president at the initial meeting, which was held in New York; F. F. Rockwell was made secretary-treasurer. Regional vice-presidents include B. Y. Morrison, Mrs. H. S. Foote, Mrs. G. G. Whitney, T. A. Weston, Kenyon Reynolds, Mrs. H. F. Cabell, and Paul M. Davis. Mr. Morrison and John T. Scheepers were named to head committees on amateur

and commercial membership. The society plans to pass on the merits of daffodils which will be coming into this country when the quarantine on narcissus bulbs is lifted later this year.

An up-to-date model in a Spencer microscope has been added to the historic collection of instruments in the Museum Building at the Botanical Garden, as a contrast to the early types on display there. It is exhibited by the Spencer Lens Company of Buffalo.

Dr. Marshall A. Howe, Director of the Garden, addressed the New York Academy of Sciences as retiring president, on "Plants that Form Reefs and Islands," at the annual meeting and dinner of the Academy held at the American Museum of Natural History on December 18.

Dr. Howe was elected President of the Torrey Botanical Club at its annual meeting held at Columbia University on the evening of January 14.

Dr. A. B. Stout lectured on "Daylilies—Old and New" before the Pennsylvania Horticultural Society, January 7, in Philadelphia.

Classes in judging amateur flower shows, under the auspices of the Federated Garden Clubs of New York State, held at the Waldorf Astoria Hotel early in January, were addressed, among others, by Dr. M. A. Howe, Dr. F. T. McLean, Mr. T. H. Everett and Mrs. Wheeler H. Peckham of The New York Botanical Garden staff.

The price of Dr. Walter E. Rogers' "Tree Flowers," which was reviewed in the January JOURNAL, should have been listed at $7.50. It was only by advance subscription that a few copies were made available at the cost-price of $5.50.

Dr. William C. Steere, instructor in botany at the University of Michigan, spent two weeks at the Garden during the Christmas holidays, preparing for distribution duplicate specimens of mosses from The New York Botanical Garden's collection. The work will be continued later.

Dr. A. C. Smith addressed the Parent-Teacher Association of Springfield, Mass., February 5, giving an illustrated lecture on the Fiji Islands.

PUBLICATIONS OF

THE NEW YORK BOTANICAL GARDEN

Journal of The New York Botanical Garden, monthly, containing notes, news, and non-technical articles. Free to members of the Garden. To others, 10 cents a copy; $1.00 a year. Now in its thirty-seventh volume.

Mycologia, bimonthly, illustrated in color and otherwise; devoted to fungi, including lichens, containing technical articles and news and notes of general interest. $6.00 a year; single copies $1.25 each. Now in its twenty-eighth volume. Twenty-four Year Index volume $3.00 in paper, $3.50 in fabrikoid.

Addisonia, semi-annual, devoted exclusively to colored plates accompanied by popular descriptions of flowering plants; eight plates in each number, thirty-two in each volume. Subscription price, $10.00 a volume (two years). [Not offered in exchange.] Now in its nineteenth volume.

Bulletin of The New York Botanical Garden, containing reports of the Director-in-Chief and other official documents, and technical articles embodying results of investigations. Free to all members of the Garden; to others, $3.00 per volume. Now in its fourteenth volume.

North American Flora. Descriptions of the wild plants of North America, including Greenland, the West Indies, and Central America. Planned to be completed in 34 volumes, each to consist of four or more parts; 81 parts now issued. Subscription price, $1.50 per part; a limited number of separate parts will be sold for $2.00 each. [Not offered in exchange.]

Memoirs of The New York Botanical Garden. Price to members of the Garden, vols. I-VI, $1.50 per volume; to others, $3.00. Vol. VII, $2.50 to members; to others, $5.00. Vol. I. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Per Axel Rydberg. Vol. II. The Influence of Light and Darkness upon Growth and Development, by D. T. MacDougal. Vol. III. Studies of Cretaceous Coniferous Remains from Kreischerville, New York, by A. Hollick and E. C. Jeffrey. Vol. IV. Effects of the Rays of Radium on Plants, by Charles Stuart Gager. Vol. V. Flora of the Vicinity of New York, by Norman Taylor. Vol. VI. Twentieth Anniversary of The New York Botanical Garden. Vol. VII. Includes New Myxophyceae from Porto Rico, by N. L. Gardner; The Flower Behavior of Avocados, by A. B. Stout; Plants Collected in the Amazon Valley, by H. H. Rusby; and The Flora of the Saint Eugene Silts, by Arthur Hollick.

Brittonia. A series of botanical papers. Subscription price, $5.00 per volume. Now in its first volume.

Contributions from The New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above. Price, 25 cents each. $5.00 per volume. In the fourteenth volume.

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pages and 601 figures. Price, $5.50 postpaid.

Manual of the Flora of the Northern States and Canada, by Nathaniel Lord Britton. 1122 pages. Second edition, 1907. $2.50.

Flora of Bermuda, by Nathaniel Lord Britton and others. 585 pages with 494 text figures. 1918. $3.50.

A Text-book of General Lichenology, by Albert Schneider. 230 pages: 76 plates. 1897. $2.50.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages. 1935. $1.65.

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GENERAL INFORMATION

Some of the leading features of The New York Botanical Garden are:

Four hundred acres of beautifully diversified land in the northern part of the City of New York, through which flows the Bronx River. A native hemlock forest is one of the features of the tract.

Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

Gardens, including a new rock garden, a large rose garden, a perennial border, small model gardens, and other types of plantings.

Greenhouses, containing thousands of interesting plants from America and foreign countries.

Flower shows throughout the year—in the spring, summer, and autumn displays of daffodils, lilacs, irises, peonies, roses, water-lilies, dahlias, and chrysanthemums; in the winter, displays of greenhouse-blooming plants.

A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants; also historic microscopes.

An herbarium, comprising more than 1,800,000 specimens of American and foreign species.

Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

Scientific research in laboratories and in the field into the diversified problems of plant life.

A library of botanical and horticultural literature, comprising nearly 45,000 books and numerous pamphlets.

Public lectures on a great variety of botanical topics, continuing throughout the autumn, winter and spring.

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JOURNAL
OF
THE NEW YORK BOTANICAL GARDEN

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T. H. EVERETT

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NOTES, NEWS, AND COMMENT

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LECTURES ON FOREIGN GARDENS SPONSORED BY ENGLISH SPEAKING UNION

Since plans are now well advanced to effect the first exchange of student-gardeners between The New York Botanical Garden and the Royal Botanic Gardens, Kew, England, the English Speaking Union of the United States has arranged a series of three lantern lectures on famous gardens of different lands. The admission fee to be charged is to defray the traveling expenses of the students. Under the arrangement Mr. Howard Swift, student-gardener at The New York Botanical Garden since September, 1934, will be enabled to spend a year at Kew, while Mr. C. J. Collins of Kew will receive a year's experience at The New York Botanical Garden. The English Speaking Unions of the United States and of the British Empire respectively have agreed to finance the transportation of the exchange students.

The first of these lectures was on "Irish Gardens" and was illustrated with colored slides shown by Mrs. Cyrus Winslow Merrell. Irish music was provided by Mrs. Frank S. Coan. The second lecture on "Persian Gardens and Mughal Gardens of India" will be presented by Mr. Frank S. Coan on March 12 at 3:30 P. M., and repeated at 8:15. Mr. Coan was born in Persia and has lived in that country as well as in Northern India and Kashmir for many years. His lecture should be of particular interest to those garden club members who plan to exhibit Persian arrangements at the International Flower Show opening in New York on March 16. The third lecture will be on "Old Gardens of Italy, France, and England, and Their Influence on American Gardens" by Robert Ludlow Fowler, Jr., to be given Thursday evening, April 2, at 8 o'clock.

These lectures are given at the rooms of the English Speaking Union at 19 West 44th Street, New York City. Tickets are priced at one dollar for each lecture and can be obtained either from the English Speaking Union or The New York Botanical Garden.

NOTES ON RUST DISEASES OF SEMPERVIVUM AND OTHER ORNAMENTALS IN THE NEW YORK AREA

To many people concerned with growing plants the term "rust" usually means any brown scabby spots on leaves or stems, whatever may be the cause of such lesions. For example, one refers to a nematode or eelworm disease of begonia as a rust because of the rough brownish spots which follow invasion by this little worm. On the farm and in the markets we hear people refer to rust on beans, meaning small rusty brown spots, or cankers, on the seeds or on the pods. Others refer to this same fungous disease as anthracnose. In recent years plant pathologists have usually limited the use of the term rust to those diseases caused by species of a certain group of fungi, the Uredinales. In most of these rust diseases certain of the pustules are filled with rust-colored powdery spores. In case of the real bean rust, one can readily brush these spores out of the pustules with a toothpick, and masses of them can be seen on the end of the pick. In this way, and because the spots are smaller and more definite, one can distinguish the true rust disease from anthracnose.

The florist and home gardener are familiar with several species of rust diseases of ornamental plants. Carnation, snapdragon, and chrysanthemum are each subject to infection by particular species of rusts. In general, the three diseases are treated by the same methods because the spores germinate best under moist conditions found in poorly ventilated greenhouses. Crowding of plants especially favors the spread of the rust. These rusts are controlled fairly well if the plants are dusted with a fine grade of sulphur, providing the temperature of the greenhouse is raised to about 70° F. for two or three days during the course of treatment. Of course, one should avoid taking cuttings from infected plants and the plants should not be dusted while they are in flower as the blossoms will usually be injured.

The life cycles of these three rust-fungi are not complete in the United States, although they are of the type that requires an alternate host. In Europe the carnation rust completes its life cycle on a species of *Euphorbia*. It is not known what the alternate hosts of the snapdragon rust and chrysanthemum rust are,

FIGURE 1. *Sempervivum tectorum* infected with the rust parasite *Endophyllum Sempervivi*. The leaves are much elongated, pale yellowish-green, and bear brownish rust pustules. In nature, the infected leaves of such a plant would stand more erect, as shown in FIGURE 2.

although it is certain that they must have an alternate host.[1] In our country the disease is spread from plant to plant by means of the repeating spores and by cuttings taken from infected plants. It goes without saying that if the rust on carnation could once be wiped out in this country we should have no more trouble with it unless it was introduced again from abroad.

Another rust disease common in nurseries and propagating houses is the rust on rhododendrons and azaleas. Quantities of seedlings are sometimes destroyed. One recognizes this disease by the bright golden to brownish spores that break out from pustules on the under side of the leaves. These repeating spores carry the

[1] The alternate host relationship is well illustrated in the case of the cedar-apple rust combination. It is definitely known that if our red cedars were destroyed we should have no further trouble with the apple rust. It is the same with the white-pine blister rust and the alternate currant and gooseberry hosts.

parasite from plant to plant rather rapidly, but the fungus is able to complete its life cycle only by attacking the hemlock.

Bowers[2] has the following to say of this rust (*Pucciniastrum Myrtilli*):

"This occurs on young seedlings of *Rhododendron ponticum* and appears as a red spotting of the foliage, with orange-red pustules, eventually becoming powdery on the under surface. This or a similar rust also occurs upon young seedlings of *R. japonicum* and other azaleas in the greenhouse. Very small seedlings may be killed; otherwise, only the lower leaves die. On *R. ponticum* this infection is often followed by Pestalotia Leaf Spot (*P macrotricha*), the latter causing brown spots and giving the impression that these dead areas were caused by the Rust disease. Dusting the plants with sulphur dust every two weeks during July and August will effectively prevent injury from rust. This should be a regular practice with *R. ponticum* seedlings."

FIGURE 2. Nursery planting of *Sempervivum* where practically every mother-plant showed rust infection. The tendency of leaves of such plants is to become much elongated and more or less erect.

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[2] Bowers, C. G. Rhododendrons and Azaleas, Their Origin, Cultivation and Development. 1-549. Macmillan Co. 1936.

FIGURE 3. Infected mother-plant in April, showing whitish etiolated leaves at the center. It was found that nine of the eleven offshoot runners carried the parasite, indicating that offshoot plants from an infected mother-plant are always likely to carry the disease.

The hollyhock rust, familiar to all home gardeners, is about the simplest of the rust diseases, although it is a very serious disease of various species of the Mallow Family. It has a very short life-cycle, which is completed on the same host plant. The control of this disease was briefly outlined in a recent number of this JOURNAL.[3]

In Europe there has long been known a rust disease of species of *Sempervivum*, but it is only within the past twenty years that the disease has appeared in this country. It was first reported by Reed[4] from the rock garden of the Brooklyn Botanic Garden. Although as yet the rust has not been widely spread, he has since then made several collections in the vicinity of New York City.

[3] Dodge, B. O. Controlling the hollyhock rust. Jour. N. Y. Bot. Gard. **35**: 186-9. 1934.

[4] Reed, George M. The discovery of *Endophyllum Sempervivi* (Alb. & Schw.) deBary in North America. Torreya **17**: 84-85. 1917.

Diseased plants may be readily recognized by pale yellowish spots on the leaf-blades about one half inch or so back of the tips. Later the pustules break open, showing bright rusty brown spores which cling together somewhat in masses. The infected leaves elongate considerably, becoming pale yellowish-green (FIGURE 1). In one nursery planting covering several square rods of ground, practically every one of the mother-plants showed infection (FIGURE 2). Infected plants never blossom. They rot away during the summer but not before numerous offshoot plants have been developed. It has been proved by Hoffmann and Ashworth of Europe that infection spreads from plant to plant by means of the spores which are shed in April and May. But they did not determine to what extent, if at all, the disease may be carried by an offshoot plant taken from an infected mother-plant.

If one takes a mother-plant with its offshoots and transplants it in an isolated region, rust will usually develop on most of its offshoot plants the following year. But this might well be due to new infections from spores shed from pustules on the mother-plant. On the other hand, since the fungus was traced by Ashworth down into the crown of the mother-plant, it might be that the parasite would grow out with the young offshoot to become established in the new crown. The writers have made a thorough study of the latter phase of this question. Taking a plant such as shown in FIGURE 3, we have studied free-hand sections stained with cotton-blue and proved conclusively that the parasite does grow down from the leaves to invade the crown, then follows out through new runner offshoots during the summer, breaking out as pustules on the leaves of the offshoot plants the following spring. Furthermore, the fungus has been traced down into the root system, even to some of the smaller roots as marked in the illustration (FIGURE 4).

There are very few species of rusts that infect their host plants systemically; one is the common orange-rust of blackberries and black raspberries. As roots from an infected blackberry plant carrying the fungus often extend out twenty or thirty feet, one can see how nursery stock obtained from root cuttings from infected plants is almost certain to carry the disease, although it will not be recognized until the next year in the new planting. It is practically the same situation with the *Sempervivum* rust. To

FIGURE 4. Infected mother plant in March. The mycelium of the rust parasite was found present not only in the bulb-like stem of the mother-plant but also in its roots down to the point marked A and in the stem and leaf-bases of the offshoot.

what extent the disease can be controlled in propagating beds by dusting with a fine grade of sulphur has not been determined. Undoubtedly this would help to prevent the spread of the parasite through its spores. On the other hand, by isolating plants in the propagating beds one should be able to obtain disease-free off-shoots by careful selection. It is strange that although this disease has now been known in the vicinity of New York for almost twenty years, it is seldom reported in rock gardens. It is safe to say, therefore, that it will not become a serious disease. Further work is being carried on by the writers to be published in detail in another connection.

B. O. DODGE
The New York Botanical Garden
and G. M. REED
Brooklyn Botanic Garden.

EPIPHYTIC PALMS AND CACTI

Birds have developed a botanical instinct among their other useful traits. They increase the geographic ranges of plants. They greatly increase the numbers of individual plants by scattering seeds beyond where the fruits would fall by gravity or be scattered by the winds, thus increasing their own food supply, as well as that of their frequent associates, the mammals. Palms and cacti furnish for birds a cuisine *par excellence*. A short sojourn, for example, in a cabbage-tree hammock in fruit, populated by a hundred or two black-birds and grackles, is a revelation as to their voracious as well as vociferous abilities. The shower of seeds on the palm leaves near the ground as the birds eat the pulp of the drupes resembles the pelting of large rain drops.

Cacti often cater to the migratory species, small and large, which are ravenously fond of the numerous seeds produced in the usually highly colored berries. Either the berries open on the plant and expose the small black seeds scattered in a pale or colored pulp, or the berry falls to the ground and opens, scattering the seeds in the sand. Birds seem to prefer the seeds that have fallen to the ground. After the berry has fallen many of the seeds become buried in the sand. These the birds will search for until, apparently, the last one is found. In the process of scratching in search of seeds the quest often continues until the cactus plant is scratched clear out of the soil.

Through these epicurian methods a bird may carry a seed or two beyond the last plant in an area, and thus gradually extend the geographic range of a species.

Through this method of seed-dispersal the warm off-shore bars and lagoon shores of the eastern coast of Florida have been populated not only with cacti, but with tropical shrubs and trees up to the Halifax River region.

But even more curious is the habit of birds to cause plants to grow on unusual habitats by planting the seeds on hosts other than the ground—that is, on other plants. This phenomenon occurs to a limited extent in general temperate regions, but it is more frequently met with in the tropics and adjacent temperate zones.

In certain primeval live-oak hammocks in the Florida peninsula are found extensive hanging gardens. The large horizontal limbs

of the oak trees are hosts, not only to the typical and usual epiphytes, but to seedlings of various terrestrial plants, usually shrubs or trees, whose seeds were placed there by birds, and less

FIGURE 1. A palm seedling starting to grow in a knot-hole of a mastic tree in a coastal hammock near Palm Beach, Florida. This seedling may be short-lived or it may survive many years.

often by mammals. These transients, however, seldom develop to any normal size. The seedlings may occur among dense masses of typically epiphytic ferns and flowering-plants, in which cases they usually succumb in dry spells. Less frequently the seeds fall into old knot-holes and fissures where sufficient humus and leaf-mold have accumulated to permit of a firm and moist anchorage for the roots of the intruder. Nearly all our native fleshy fruits or their seeds are sought after by birds. Among the plants most eagerly searched out are the palm and the cactus where these plants occur naturally, the first-named producing great quantities of fruits, the second, great quantities of seeds.

In a former paper[1] reference was made to the excess tissues often developed in plants and the advantage they sometimes render under abnormal circumstances. Another interesting phenomenon often encountered is the great amount of tissues a plant may manufacture from very scant raw materials in wholly abnormal habitats.

Unusual specimens are usually met with in the coastwise or dune hammocks. FIGURE 1 shows a seedling palm growing from a rotten cavity in the trunk of a mastic tree (*Sideroxylon*). The seed may have been dropped in the cavity many years ago, for palm seedlings, especially in such a habitat, are of very slow growth, depending on the frequency of rains and the length of rainy seasons. Mastic trees seem to be frequent hosts for epiphytic palms along the lower Florida coasts. FIGURE 2 shows how a cabbage-tree (*Sabal Palmetto*) will live and thrive on the dry remains of a mastic log which it has occupied as a host from the time the mastic was alive and the trunk was much larger. As in the case of the prickly-apple to be described and illustrated below, it seems almost incredible that this palm has been able to live and thrive on the food and moisture it could get from the now dead trunk of a mastic.

In the Cape Sable region of Florida many unusual and contrary phenomena may be found. Conspicuous among these are the cases of such typically terrestrial plants as cacti—prickly-pears and prickly-apples—growing on tree-trunks! Contrary to what one would expect, these plants flourish in their epiphytic habitat just about as well as they do when rooted in the ground.

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[1] Jour. N. Y. Bot. Gard. **36**: 261-270. 1935.

The prickly-apple (*Harrisia Simpsonii*) shown in FIGURE 3 is in the hammock back of Madeira Bay. It is rooted in an old buttonwood (*Conocarpus*) log, which is held about three feet above the ground. This cactus had been growing on the log for

FIGURE 2. A cabbage-tree—*Sabal Palmetto*—growing on a mastic trunk on Jupiter Island, Florida. When the host decays the palm can take to the ground and continue to grow.

FIGURE 3. A prickly-apple plant—*Harrisia Simpsoni*—growing on a log of buttonwood—*Conocarpus erecta*. The ground beneath is wet most of the year. The prickly-pear (*Opuntia*) of the region often betakes itself to the horizontal trunks of the buttonwood.

a long time, as was evidenced by the spent stems of different ages lying on the ground beneath or hanging still attached to the parent plant. How this large succulent got sufficient moisture and food from the dead hard wood of a buttonwood log is a mystery. These cacti are sometimes found in the trees ten to fifteen feet from the ground.

Epiphytic cacti are well known in the tropics as inhabitants of trees, and one (*Rhipsalis Cassutha*) has been found in a hammock on the Everglade Keys off southern Florida. But it is seldom that species of *Opuntia* and *Harrisia* are found as ephiphytes, as recorded here.

JOHN K. SMALL.

SPRING LECTURES AT THE GARDEN

Lectures to be given at The New York Botanical Garden during March, April, and May include practical gardening topics, nature study subjects, and a travelogue of a botanical trip through Fiji. The lectures are given in the Museum Building on Saturday afternoons at half-past three, and last one hour. They are all illustrated with colored lantern slides. The subjects follow:

March 7. "Spring Wild Flowers," Dr. John Hendley Barnhart, Bibliographer and Administrative Assistant.
March 14. "Fiji and its People," Dr. Albert C. Smith, Associate Curator.
March 21. "Shrub Novelties," Mr. Henry Teuscher, Dendrologist.
March 28. "Shady Gardens," Dr. Forman T. McLean, Supervisor of Public Education.
April 4. "Rock Garden Construction," Mr. A. C. Pfander, Assistant Superintendent.
April 11. "New Daffodils and How to Use Them," Mrs. Ethel Anson S. Peckham, Honorary Curator, Iris and Narcissus Collections.
April 18. "Diseases and Pests of Ornamental Plants and Their Control," Dr. B. O. Dodge, Plant Pathologist.
April 25. "Pollen Grains," Dr. R. P. Wodehouse, Arlington Chemical Company.
May 2. "Daylilies: Old and New," Dr. A B. Stout, Director of the Laboratories.
May 9. "Mushrooms, Edible, Poisonous, and Otherwise Interesting," Dr. Fred J. Seaver, Curator.
May 16. "The Plant Life of the Sea," Dr. Marshall A. Howe, Director.
May 23. "Rock Garden Plants at The New York Botanical Garden," Mr. T. H. Everett, Horticulturist.

HOW TO REACH THE MUSEUM BUILDING

The Museum Building is reached by the Harlem Division of the New York Central Railroad to Botanical Garden Station, by

trolley cars to Bedford Park Boulevard, or by the Third Avenue Elevated Railway to Botanical Garden, Bronx Park. Visitors coming by the Seventh Avenue and Lexington Avenue subways change to the Elevated Railway at 149th Street and Third Avenue. Those coming by the Eighth Avenue Subway (Independent System) walk east from the Grand Concourse at Bedford Park Boulevard (200th Street). Those coming by the New York, Westchester and Boston Railway change at 180th Street for crosstown trolley, transferring north at Third Avenue.

A GLANCE AT CURRENT LITERATURE*

How to differentiate the common diseases of dahlias and how, if possible, to cure them are told by R. P. White in Bulletin 361 of the New Jersey Agricultural Experimental Station. A brief list of resistant varieties is given.

* * *

Farm Research, published by the New York Agricultural Experiment Station, explains in the issue of January 1 how the state's inspection of soil inoculants becomes a form of crop insurance for the farmers of New York.

A new tomato, called Nystate, of the second-early class, is also described in this number.

* * *

The history, uses, and legends surrounding many subtropic trees, including the ancient Cypress of Tule, known as the third largest tree and one of the oldest in the world, are given in the January number of *American Forests* by G. Cunningham Terry, who writes on "Trees of Old Mexico."

* * *

Part 2 of the tribe Tillandsieae is the subject of Lyman B. Smith's "Studies in the Bromeliaceae VI," recently published as Volume 70, No. 5, of the *Proceedings* of the American Academy of Arts and Sciences.

* * *

Two articles on plant-hunting expeditions in the Rockies—one in Canada by Robert M. Senior and one in Colorado by Kathleen N. Marriage—in the October number of the *National Horticul-*

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* All publications mentioned here—and many others—may be found in the Library of The New York Botanical Garden, in the Museum Building.

tural Magazine indicate the increasing attention being given to native plants of America, especially alpine subjects. Among the other interesting articles in the book is one on the hybridizing of begonias, by Alfred D. Robinson.

* * *

Thirty-two native *Cactus* species, including two lately discovered and several indigenous ones, are described by Marion Sherwood Lahman in an article called "Cactuses of Oklahoma" in *Nature Magazine* for January. Eight of them are illustrated in flower.

* * *

"Ecological Studies on the High Plateaus of Utah" by Helen Dixon in *The Botanical Gazette* for December, explains the geological history and present topography of the region, describes the plant zones, and treats of the vegetation in each.

* * *

Other current work of interest in ecology is contained in *Ecological Monographs* for January. "Studies of Certain Coastal Sand Dune Plants of Southern California" by Edith A. Purer is illustrated with an abundance of microscopic drawings; "Forests of the Illinoian Till Plain of Southwestern Ohio" by E. Lucy Braun is illustrated with photographs and charts.

* * *

Another section of *Moss Flora of North America,* being published by A. J. Grout in Newfane, Vt., has appeared. As Part 3 of Volume 2, it contains a continuation of the Bartramiaceae by Seville Flowers, the Timmiaceae and Aulacomniaceae by Geneva Sayre, and the beginning of the Bryaceae by A. LeRoy Andrews. Excellent illustrations of minute plant details accompany the scientific text.

* * *

The December *Bulletin* of the Missouri Botanical Garden describes the "skyscraper" type of greenhouse which has been erected for the institution.

* * *

Among the month's topics in the January *Flower Grower* are the new annuals, begonias, berry-bearing shrubs, hybrid amaryllis, roses, Boston ferns, rhododendrons, and English iris.

* * *

Results of experiments in growing seedling pines with and without mycorrhizal association are reported in the January *Journal*

of Forestry by A. B. Hatch. The seedlings were found incapable of normal growth except when artificially provided with mycorrhizal fungi, the author states. "The extensive program of afforestation in the prairie region as contemplated in connection with the Shelterbelt project makes additional research on this problem imperative," he says.

* * *

Experiments on the control of dandelions in blue-grass lawns by means of petroleum sprays are reported in *Science* for January 17 by W. E. Loomis and N. L. Noecker of Iowa State College. Investigations will be continued, the authors state; but meanwhile they indicate that results have been most satisfactory in both preventing and eliminating this common pest of lawns without damaging the grass.

* * *

Among the items in the supplement of that issue of *Science* is a note concerning the prickly-pear cacti which have been recently illustrated flanking machine-gun nests in Ethiopia. American barbed-wire manufacturers, it is said, have refused to take orders from the belligerent powers, but American cacti, naturalized after having been introduced by early European explorers in the New World, are serving the purposes of barbed wire in the war.

* * *

Three recent bulletins of the New York State Agricultural Experimental Station at Geneva deal with the bean mosaic, which has destroyed many crops in this state in the last few years. Bulletin 656 gives a popular treatment of the mosaic of the Refugee bean, while Technical Bulletins 235 and 236 give more detailed treatment of the physiology of the bean mosaic and of its transmission. All are by Arthur L. Harrison.

* * *

A reprint from the January *Bulletin of the Horticultural Society of New York* gives a résumé of J. E. Spingarn's recent lecture on "Clematis for American Gardens." A list is included, naming desirable varieties and the dealers from whom they may be obtained.

* * *

Suitable mulches for the winter protection of peonies are described by C. H. Connors in the January number of the American

Peony Society *Bulletin*. Benjamin Wilder Guppy gives useful hints for beginners in the growing of seedling Peonies.

* * *

In "Waterlilies—Hardy and Tender" in the *Gardeners' Chronicle of America* for February, George H. Pring deals with the culture of both types of plants and the crossing of choice varieties. In the same number, George H. Gillies describes the specialized treatment which he accords sweet peas in the New York area, and George Graves tells how to propagate ericaceous plants, giving detailed directions for the care of individuals in the home garden in every stage of growth.

* * *

Notes on the development and culture of the Montbretia (in the botanical manuals known as *Tritonia*) are given by Fr. Hubert of St. Bonaventure College, New York, in the February *Flower Grower*. He suggests many outstanding varieties to seek for the garden. "Perennials on Parade" by F. F. Rockwell describes some of the finest of flower subjects from recent catalogues.

* * *

In the *Gardeners Chronicle* of January 25, James Esson describes winter-flowering begonias as he has grown them on Long Island, giving the cultural directions which are producing for him many plants three feet in diameter. Fine specimens of a number of varieties which he mentions are to be seen in the greenhouses at The New York Botanical Garden.

* * *

Diseases of plants which were reported in the United States during 1934 are listed in the annual supplement (No. 90) of the *Plant Disease Reporter* issued by the Bureau of Plant Industry of the United States Department of Agriculture. First, the official collaborators on the survey are named; the weather for the year is outlined by maps and graphs; then diseases of cereal crops, forage and cover crops, fruits and nuts, vegetables, special crops, trees, and ornamentals are described. The index includes the names both of the diseases and of the causative organisms.

* * *

The term "ripening" is applied to storing of reserve food for future use by the plant for growth and reproduction in a four-page article by the editors of *The New Flora and Silva* in the January number. The old belief that summer sun was responsible

for the ripening of plants is still found somewhat true, the editors maintain; it is only the application of the principle which is at fault. They describe the phenomenon briefly in different types of plants.

* * *

The first number of the New York Microscopical Society *Bulletin,* which made its initial bow in February, consists of a description of the Myxomycetes by Robert Hagelstein.

* * *

Recent pamphlets on regional flora of the Western Hemisphere include Paul C. Standley's sixth number of "Studies of American Plants," containing principally South American Rubiaceae and issued as Publication 352 of the Field Museum of Natural History; M. L. Fernald's "Midsummer Vascular Plants of Southeastern Virginia" and W. B. Drew's "The North American Representatives of Ranunculus § Batrachium," these two issued as Contributions CIX and CX from the Gray Herbarium of Harvard University; notes on a number of new and little-known species in *Leaflets of Western Botany,* No. 17; and, from an ecological point of view, E. Lucy Braun's "Vegetation of Pine Mountain, Kentucky," reprinted from *The American Midland Naturalist.*

CAROL H. WOODWARD.

NEW BOOKS ON THE LIBRARY SHELVES

Two large volumes, illustrated with several hundred reproductions of early drawings, paintings, and tapestries which reveal (unwittingly in most instances, no doubt) the current conceptions of a garden, comprise "Mediaeval Gardens" by the late Sir Frank Crisp. The author, who was treasurer and vice-president of the Linnean Society of London, spent much of his life in gathering material on the gardens of centuries past. Illustrations are all from original sources which he himself collected. The work, which has been edited by his daughter, Catherine Childs Patterson, is published by The Bodley Head, London. It contains, according to the title page, "'Flowery Medes' and other arrangements of herbs, flowers and shrubs grown in the Middle Ages, with some account of Tudor, Elizabethan, and Stuart gardens." But it contains for the reader much more than that—a flavor of early life

in many countries. The numerous quotations from sources make the two books invaluable as reference works for the gardens of Europe during about ten centuries.

* * *

Excerpts from the adventures of that dauntless Scottish explorer for plants, George Forrest, the results of whose years in Asia are being given to the world by the Royal Botanic Garden of Edinburgh, are contained in a small, entertaining volume brought out last year by the Scottish Rock Garden Society. The most important plants, from a horticultural standpoint, are given special attention throughout the book and are individually described in a special chapter.

* * *

Two important volumes in paper have recently come from the Field Museum of Natural History. Publication 350 is "The Forests and Flora of British Honduras" by Paul C. Standley and Samuel J. Record; Publication 351 is Part 1 of a "Flora of Peru" by J. Francis Macbride.

* * *

Designing her book as a text for advanced students of botany and as a reference for experienced investigators, Josephine E. Tilden has done a monumental piece of work in "The Algae and Their Life Relations," which the University of Minnesota Press has published. The book contains 550 pages with more than 250 illustrations, including a frontispiece in color. Economic uses of algae form an interesting section of the text.

* * *

Another new book on algae comes from the Cambridge University Press (issued in America by The Macmillan Company). It is a 791-page volume by F. E. Fritsch on "The Structure and Reproduction of the Algae, Vol. I," completely indexed, with extensive references to other literature on the subject, and numerous illustrations.

* * *

The year-book of the Deutschen Dendrologischen Gesellschaft for 1935 contains considerable material of interest to those American readers who do not balk at a German text. Besides systematic treatment of the Cycadaceae and of the genus *Larix*, the book contains interesting dendrological notes from Florida by J. C. Th.

Uphof of Orlando, and a long article on *Abies grandis,* illustrated by many photographs from western United States. The trees of Portugal are the subject of one article. "Die Deutsche Bäume in der Volkskunde" gives the curious background of many legends and beliefs regarding trees.

* * *

"Possibilities of Shelterbelt Planting in the Plains Region" is the title of an imposing volume—unfortunately only in paper binding—prepared under the direction of The Lake States Forest Experiment Station of the United States Forest Service. Containing 200 pages of more than ordinary size, the book presents many phases of the afforestation problem, illustrated with numerous maps, charts, tables, and photographs, and written by botanists, foresters, soil scientists and others, including both government and university experts. F. A. Silcox, Chief of the Forest Service, opens with a statement on the Shelterbelt problem. The volume is completely indexed.

* * *

Enthusiasts of the sand-dune regions along the ocean's border will no doubt enjoy "The Book of the Seashore" by Howard J. Shannon[1], a naturalist who has spent a great part of his lifetime roaming the shores of Long Island and New Jersey at all seasons, observing and studying the plant and animal life and the shifting topography. To those of botanical inclinations, the chapters entitled "The Struggle for Survival among Plants" and "The Past and Surviving Forests of our North Atlantic Shores" will prove most tempting. An appended list gives the names of all plants and animals mentioned in the book, with their scientific equivalents. In the preparation of the botanical phases of the work, the author was aided by Dr. Harold N. Moldenke of The New York Botanical Garden.

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[1] Shannon, Howard J., The book of the seashore, illustrated by the author. 281 pages. Doubleday-Doran, Garden City, N. Y., 1935. $3.50.

A NEW GARDEN ENCYCLOPEDIA

Thirteen hundred pages of garden brevities of most diverse character, for the busy home gardener—that summarizes this latest addition to the amateur gardener's book shelf.* Compare this with the 3639 pages of Bailey's Cyclopedia of Horticulture, and you have the matter in a nutshell. This new book has both the virtues and faults of brief treatises everywhere. It tells something about every big group of gardening interests—yet tells in it such abbreviated form as to be easy reading, and to whet the appetite for more.

Clear non-technical language, an excellent guide to the pronunciation of all scientific names, and surprisingly good treatment of the economic crops—fruits and beans—and some of the most popular garden flowers—iris, dahlias, orchids and begonias—are among its prominent virtues. The treatment of gardening in different sections has in it much food for reflection. The most populous gardening section of the country, from New York to Washington, is so fully treated in the detailed discussions that it is not given separate consideration here.

Hardiness of plants is frequently referred to by landmarks along the Atlantic seaboard—Washington, Philadelphia and New York City, but in the treatment of gardening by regions, one fails to find this region discussed.

Considerable space is devoted to birds, and to insects and diseases—the latter treated by Dr. Cynthia Westcott. Seed sowing and other garden operations are given less detailed treatment than the discussions of shrubs and bulbs—perhaps wisely, since the latter are easier subjects for the beginning gardener.

Withal, it is a readable book, well printed and illustrated, well worth its modest cost to the seeker after a type of non-critical reading about gardening. There has long been a demand for such a book, and Mr. Seymour's easy style of presentation makes this a particularly acceptable book for the beginner. The editor was assisted in the preparation of the volume by Miss Carol H. Woodward of our staff.

FORMAN T. MCLEAN.

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* The Garden Encyclopedia, edited by E. L. D. Seymour—Wm. H. Wise & Company, New York, 1936. $4.

CONFERENCE NOTES FOR FEBRUARY

At a conference of the Staff and Registered Students held on February 26, three topics were presented, as outlined below.

"Notes on Fijian Plants" were given first by Dr. A. C. Smith. According to Guppy and other students of Pacific plants, he said, there have been three important periods of immigration of Spermatophytes into the Pacific region: 1. The period during which the coniferous genera *Agathis, Podocarpus*, and *Dacrydium* migrated into Fiji, presumably then at the edge of a continent. 2. The period of the migration of Compositae and Lobeliaceae, probably from America into the newly formed Hawaiian and Tahitian groups. 3. The eastward migration of Indo-Malayan genera. Fiji is much poorer in number of endemic genera than the groups of the eastern Pacific. Seemann (Flora Vitiensis, 1865-1873) listed sixteen genera which he believed endemic to Fiji, but only four of these have stood the test of time, the others having either been found elsewhere or found untenable as genera. The recent collections of Gillespie and of Dr. Smith uncovered seven more genera believed to be endemic to Fiji. It is noteworthy that of the eleven genera now considered endemic to Fiji, eight belong to the Rubiaceae. In the collection made by Dr. Smith in 1933-34, more than 20 genera were discovered in Fiji for the first time. Without exception these are Indo-Malayan genera, and their discovery in Fiji bears out the accepted theory that the Polynesian flora is the result of eastward migration of the richer Indo-Malayan flora.

Mr. T. H. Everett displayed blooming plants of *Primula floribunda* and *Primula verticillata*, of the diploid hybrid of these two species which has been propagated as a clone under the name *Primula kewensis*, and of the tetraploid type which has been derived from the diploid form. The original clone of *"Primula kewensis"* is sterile from the abortion of spores. The tetraploid form is highly fertile, and breeds true from seeds. Mr. Everett discussed the origin of these types and their uses in horticulture.

"Views of a Horticulturist on Disease Resistance in Plants" was presented by Mr. Henry Teuscher. It was emphasized that resistance to disease is often a complex matter which involves numerous factors; that in many cases of resistance, as distin-

guished from immunity, the cultural conditions and various factors of environment determine whether or not the plants escape infection; and that the most important factor or cause of escape from infection should be determined and utilized in each of the various cultivated plants.

A. B. Stout,
Secretary of the Conference

NOTES, NEWS, AND COMMENT

At the annual exhibition of the New York Microscopical Society held at the American Museum of Natural History on February 15, one of the exhibits attracting the greatest crowds throughout the evening was the "Life Cycle of the Mycetozoa" staged by Robert Hagelstein, Honorary Curator of Myxomycetes for the Botanical Garden. Under microscopes were shown the germination of living spores, the plasmodium with its continuous motion back and forth, and the fruiting bodies of one species. Several plasmodia were also shown in different stages and a collection of about 60 species in the fruiting stage was displayed. Mr. Hagelstein is a former president of the society.

Dr. Mildred E. Mathias returned to the Garden in February to complete her manuscript on the Umbelliferae for *North American Flora*. She obtained her doctor's degree from Washington University, St. Louis, through her work on this family, in the taxonomy of which she has been specializing for several years.

Dr. Michael Levine, who, during his sabbatical leave from the New York public schools, has been working on plant "cancers" at Montefiore Hospital in New York, recently visited the Botanical Garden, where he frequently comes for conferences.

Dr. Grant D. Darker, Research Associate in the Farlow Herbarium of Harvard University, spent a day in The New York Botanical Garden recently, working over certain collections of fungi in the Mycological Herbarium. Dr. Darker is continuing the work of A. B. Seymour on the "Host-Index of the Fungi of North America," an indispensable work to mycologists.

Other February visitors, doing research work in mycology, include Dr. H. M. Fitzpatrick and Lawrence White of Cornell Uni-

versity, Dr. Dow V. Baxter of the University of Michigan, and Dr. Paul W. Graff.

Dr. E. D. Merrill of Harvard University spent the week-end of February 22-23 at The New York Botanical Garden in the interest of his work on Chinese flora.

Dr. A. B. Stout gave an address on "The Origin and Improvement of Cultivated Plants" during the recent annual meeting of the Technical Association of the Pulp and Paper Industry. Special mention was made of the project in breeding hybrid poplars, in which work The New York Botanical Garden has coöperated with the Oxford Paper Company, and of the relation of such breeding to reforestation.

Early examples of American botanical and horticultural literature, some of which were lent by The New York Botanical Garden, comprised a large exhibit, lasting through March 4, at the Garden Club of America office, 598 Madison Avenue, New York. Works of such well-known early botanists as Eaton, Nuttall, Bartram, Elliott, and Barton were shown, also some newly discovered original drawings made for Barton's "Elements of Botany." Among the interesting historical books on view were Jared Eliot's "An Essay upon Field Husbandry in New-England, as it is, or may be Ordered," dating from 1748, and E. Sayers' "Treatise on the Dahlia and the Cactus" (1839), believed to have been the first work devoted to a special flower subject.

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GENERAL INFORMATION

Some of the leading features of The New York Botanical Garden are:

Four hundred acres of beautifully diversified land in the northern part of the City of New York, through which flows the Bronx River. A native hemlock forest is one of the features of the tract.

Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

Gardens, including a new rock garden, a large rose garden, a perennial border, small model gardens, and other types of plantings.

Greenhouses, containing thousands of interesting plants from America and foreign countries.

Flower shows throughout the year—in the spring, summer, and autumn displays of daffodils, lilacs, irises, peonies, roses, water-lilies, dahlias, and chrysanthemums; in the winter, displays of greenhouse-blooming plants.

A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants; also historic microscopes.

An herbarium, comprising more than 1,800,000 specimens of American and foreign species.

Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

Scientific research in laboratories and in the field into the diversified problems of plant life.

A library of botanical and horticultural literature, comprising nearly 45,000 books and numerous pamphlets.

Public lectures on a great variety of botanical and horticultural topics, continuing throughout the autumn, winter and spring.

Publications on botanical subjects, partly of technical, scientific, and partly of popular, interest.

The education of school children and the public through the above features and the giving of free information on botanical, horticultural and forestral subjects.

The Garden is dependent upon an annual appropriation by the City of New York, private benefactions, and membership fees. Applications for membership are always welcome. The classes of membership are:

Annual Member	annual fee	$ 10
Sustaining Member	annual fee	25
Garden Club Membership	annual fee for a club	25
Fellowship Member	annual fee	100
Member for Life	single contribution	250
Fellow for Life	single contribution	1,000
Patron	single contribution	5,000
Benefactor	single contribution	25,000

Contributions to the Garden may be deducted from taxable incomes. Bequests may be made in the form of securities, money, or additions to the collections. The following is an approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 *of* 1891, *the sum of* ———.

Conditional bequests may be made with income payable to donor or any designated beneficiary during his or her lifetime.

Fellowships or scholarships either in perpetuity or limited to a definite period may be established for practical student-training in horticulture or for botanical research.

All requests for further information should be sent to

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JOURNAL
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THE NEW YORK BOTANICAL GARDEN

ANNUAL REPORT OF THE DIRECTOR FOR THE YEAR 1935
MARSHALL A. HOWE

TREASURER'S REPORT FOR THE YEAR ENDING DECEMBER 31, 1935

BREEDING FOR HARDY SEEDLESS GRAPES
A. B. STOUT

MEDITERRANEAN EXHIBIT AT FLOWER SHOW WINS GOLD MEDAL FOR GARDEN

NEW FELLOWSHIP FUND ESTABLISHED THROUGH ADDITION TO ANDERSON GIFT

THE BRITTON BEQUEST

BOTANICAL GARDEN TO HANDLE NEW REPRINT OF "ILLUSTRATED FLORA"

PLANTS OF FUCHSIA MAGELLANICA NOW AVAILABLE

NOTES, NEWS, AND COMMENT

PUBLISHED MONTHLY BY THE NEW YORK BOTANICAL GARDEN
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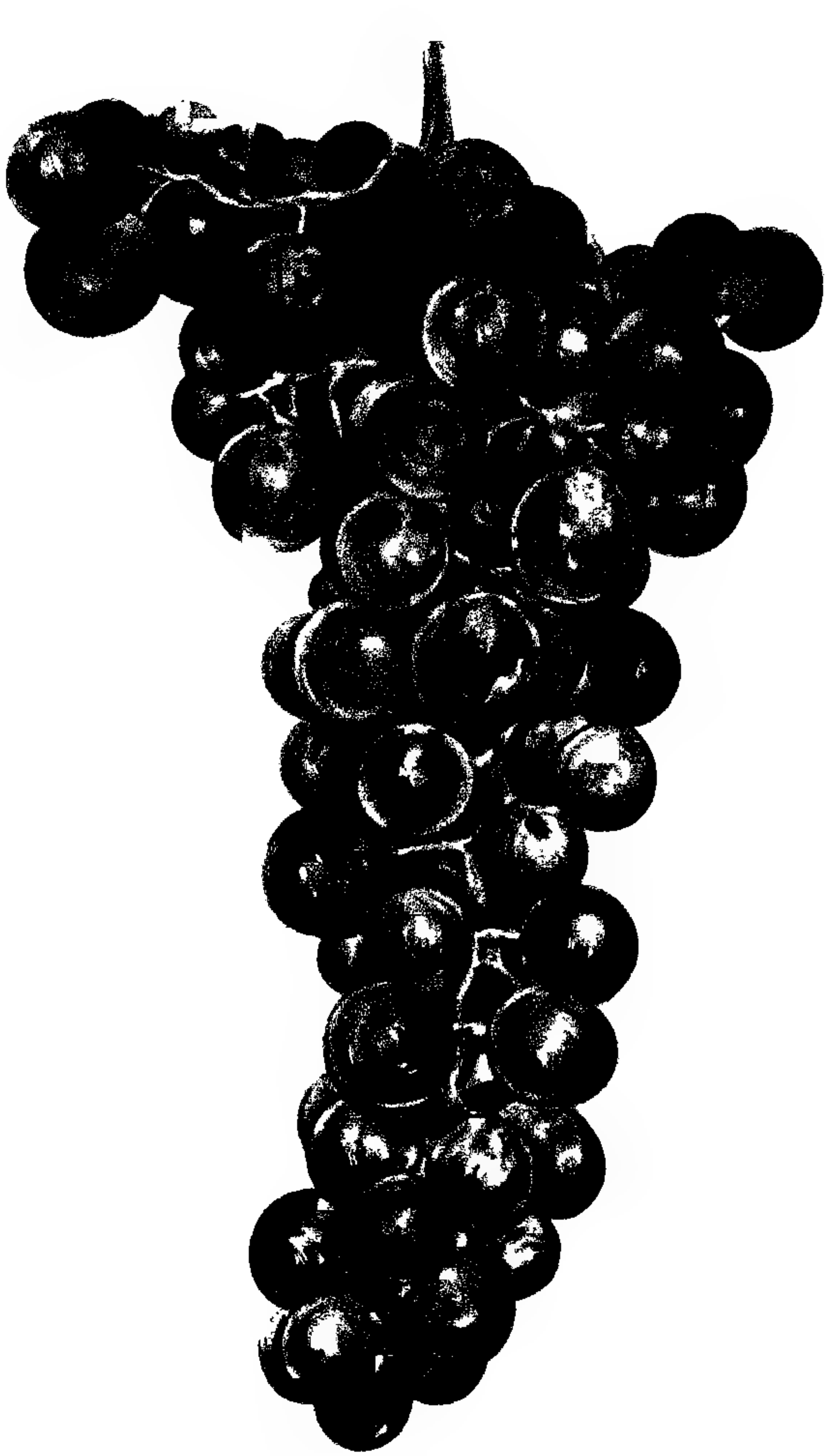

The "Bronx Seedless" Grape
(4/5 natural size)

JOURNAL
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ANNUAL REPORT OF THE DIRECTOR FOR THE YEAR 1935

An unexpected feature of the administration for the year 1935 was the resignation of Director Elmer D. Merrill, effective on October 1, to accept an important administrative position in Harvard University, and the appointment of Dr. Marshall A. Howe as his successor. It thus happens that the responsibility for the first nine months of the year for which I am now reporting belongs in a large measure to Doctor Merrill.

By economical management, for which credit is due chiefly to Mr. Henry de la Montagne, Business Manager and now Assistant Director, the Garden has been able to break even financially, or a little better, even after restoring $5,000 to principal funds in continuation of our commendable practice of paying back borrowings of previous years. It is heartening to know that one more $5,000-payment will close up this hole in our endowment funds, which borrowings at one time reached the maximum high figure of nearly $50,000. Our total income for the year was $349,888.54, $9,826.65 more than for the year preceding. While we have justly congratulated ourselves on the soundness of our investments and the small shrinkage in their yield, we have been confronted during the past year, more than formerly, by the calling of a considerable number of 5- and 6-per cent bonds and the necessity of re-investing the resulting cash at a much lower rate of interest. This is bound to have an unfavorable effect on the present year's income, for which some balancing source of income should be found, if possible. On the other hand, our permanent endowment funds have been increased by $13,646.63, of which $7,846.63 represents profit from sale of securities, $4,400, a second payment from the Britton legacy, and $1,000 to be added to the endowment of *Mycologia* from

a friend who had previously given a like amount for the same purpose and who still wishes to remain anonymous.

Horticultural Developments

Continued progress in both the outdoor and under-glass plantings, under the immediate direction of Mr. T. H. Everett and his able assistants, has been manifest throughout the year 1935. Close coöperation with the pathologist, Dr. B. O. Dodge, has resulted in especially clean and healthy stock. The good results of a liberal adding of humus-forming materials accumulated in recent years from properly developed compost heaps, clean supplies of leaf-mold, and carefully stored stable-manures, have been evident in both indoor and outdoor plantings.

An important factor in the general improvement has been the establishment of the training courses for young American gardeners, which will assist eventually in providing American owners of estates and nurserymen with native-born gardeners with a training comparable to the best now obtainable abroad. The immediate result has been to bring to the Garden a number of alert young men, who are keenly interested in their work and are also able to give intelligent and courteous service to the inquiring public. Negotiations have been continued with the Royal Botanic Gardens at Kew with the object of arranging a temporary exchange of a student-gardener with that institution, and a member of our Board of Managers has generously offered the sum of two hundred dollars towards the transportation expenses involved.

During the year the collections of living plants have been considerably augmented by gift, exchange, and purchase. This applies especially to the collection of succulents, which has been increased by 358 species of cacti and 182 species of succulents other than cacti. The collections of plants, mostly succulents, native of South Africa, including rare and fascinating members of the Ice-plant Family (Ficoidaceae) received important additions through the generosity of Mrs. Jerome W. Coombs of Scarsdale, a member of our Advisory Council; through exchange with the Royal Botanic Gardens at Kew, England; and through our financial participation in the collecting expedition into Namaqualand, recently made by Mr. R. H. N. Smithers.

A notable donation made during the autumn by John D. Rockefeller, Jr. consisted of six large orange trees in tubs, six oleanders,

and three camellias, which add attractive features to our display houses. We are indebted also to Mr. Stanley G. Ranger, a member of the Corporation, for donations of many valuable and unusual items to our collections.

Plants raised in the Propagating House for outdoor displays included approximately 2,000 cannas, 24,000 annuals, and 3,000 chrysanthemums, as well as 7,000 plants of *Primula, Myosotis,* pansies, etc., for use in the spring of 1936.

An area of about two acres, west of Conservatory No. 1 and near the terminus of the Third Avenue Elevated Railroad, is being put into condition for a new iris garden, for which divisions of about 250 of the best bearded irises formerly growing south of the old rock garden have been transplanted to specially prepared soil near the Propagating House, preparatory to being set in the new location.

The annual flower borders near Conservatory Range No. 1 were for the most part planted about as in the previous year. They were very attractive and received many admiring comments. The beds in the south court of this conservatory were set in an original subtropical manner with red-flowered and red-foliaged plants in conjunction with generous masses of gray-foliaged plants, 48 different species and varieties being used to produce very striking effects.

The Rose Garden enjoyed the most successful year of its existence, due to effective coöperation of the Bobbink & Atkins firm, our gardening force, and our pathologist, Dr. Dodge. Improvements have been made which should ensure even better results in 1936.

The Dahlia Border, after a slow and rather disappointing start, did much to redeem itself during its last six weeks, when it was an attractive mass of color. The date of the last live dahlias was considered to be November 23, ten days later than the previous latest date in the eighteen years of the existence of the special Dahlia Border. Many of the newer and better smaller-flowered European varieties were shown, in addition to the big-flowered American varieties, and it is expected that this feature will be further developed the coming season.

A favorable season, with its Indian-summer ending, combined with good cultural methods and the eradication, under the direction of Doctor Dodge, of the previously troublesome parasitic nema-

todes, resulted in what has been described as the best show of hardy and semi-hardy chrysanthemums ever seen at the Botanical Garden. These were planted in two long borders north of Conservatory Range No. 1.

The border maintained by the Advisory Council was kept up in close coöperation with Mrs. Ellen Shipman, Landscape Architect. In the autumn, a section comprising one fourth of the whole was reworked and replanted. A lowering of the border path is now contemplated.

Progress has been made in construction work and planting of the Thompson Memorial Rock Garden. The fence around the garden is now essentially complete.

The labeling of the living collections has received much attention during the year and special credit in this connection is due to Mr. E. J. Alexander.

The collection of daylilies (*Hemerocallis*), under the personal direction of Dr. A. B. Stout, drew increasing attention from professional and amateur gardeners and from the general public. As a result of many crossings, varieties have been developed whose flowers show a wide departure in both color and form from the old-fashioned yellow and orange strains in vogue with our immediate ancestors. Various shades of pink, red, and maroon are now developed, also dwarf and tall, early and late varieties. The Garden Club of America is undertaking a five-year study of the daylilies, with the coöperation of Dr. Stout. Progress has been made in securing 24 water-color paintings of folio size, illustrating some of the native Asiatic species and recent hybrids of *Hemerocallis*, with a view to early publication.

Greenhouses

Several important steps directed toward the rehabilitation and better display of the exhibits in Conservatory Range No. 1 have been undertaken during the past year. House No. 5 has been remodeled chiefly for the display of plants that are brought to flowering size in Conservatory Range No. 2, thus adding to what the Garden has to offer to the general public. In House No. 7, the central portion has been arranged with tufa rock as a ground base and has been planted in a naturalistic manner with cacti of 46 genera, with 228 named species, besides 33 plants as yet unnamed. In House No. 8, a representative and attractive collection

of South African succulents has been taken from the pots and planted out in a bed on a side bench. The plants are in a thrifty condition and several species have blossomed for the first time at the Botanical Garden and possibly for the first time in America. In House No. 9, the bridge that previously spanned the aquatic tank has been removed and more space has been provided for the growing of *Victoria regia*, the giant water-lily from South America, which always attracts the interest of the visiting public. In House No. 11, the bananas and certain other large tropical plants have been removed from their tubs and planted out in a rich, especially prepared soil, resulting in a marked improvement in their general health and attractiveness.

At Conservatory Range No. 2, the renewing of the topsoil in the Central Display House, begun the previous year, was completed and there was a certain amount of replanting, with an increase of species having a pronounced decorative value. With the aid of workers from the emergency relief rolls, a root-cellar and a steam soil-sterilizer were installed at Range 2, both of which should be of value in raising plants of high quality.

Pathology

The Plant Pathologist, Dr. B. O. Dodge, reports that all of the elms affected by the so-called Dutch elm-disease or dying from any other cause have been removed and burned, and that no further extension of the trouble has been observed in our region. Through the effective coöperation of the State Conservation Commission, the mild infestation of the Garden by the gypsy moth seems to have been checked. Japanese beetles were present in greatly increased numbers, as compared with any previous year. Arsenate of lead was liberally used as a spray of infested lawns and the good results were manifest. Trees that were attacked, such as cherry, sassafras, and linden, were sprayed twice with a solution of arsenate of lead to which fish-oil had been added. In the case of roses, the flowers of which are damaged by spray, hand-picking was resorted to and it is estimated that about 45,000 beetles were caught in this way. And about 175,000 beetles were caught in the traps loaned to the Garden by the Japanese Beetle Commission of the U. S. Department of Agriculture. In addition to the elimination of eel-worms from chrysanthemums and certain succulents,

Dr. Dodge gave some attention to the study and suppression of bacterial diseases of *Delphinium* and *Impatiens* and to the black-spot of roses.

Laboratories

Plant-breeding by Dr. Stout and his assistants, Miss Clyde Chandler and others, has been devoted largely to the daylilies, as mentioned above, and to the production of seedless grapes, carried on in coöperation with the New York Agricultural Experiment Station at Geneva. A large number, now more than 80 seedlings, have been developed, apparently hardy in the New York climate and of great horticultural promise. Out of these, the best will be selected for propagation. A report on this work will soon be published by the New York Agricultural Experiment Station. Dr. Stout's production of fast-growing poplars, of use in the paper-pulp industry, begun several years ago in coöperation with the Oxford Paper Company, has given many excellent hybrids, the best of which are being distributed widely, not only in America, but in foreign countries as well. His studies of the true lilies (genus *Lilium*) have been concentrated chiefly on the tiger lily and the madonna lily.

Museum and Herbarium

No important changes have been made in the museum exhibits, although suggestions for improvements have been made.

The herbarium has been growing with unabated activity. Besides the pasting in of many thousands of clippings and copies of original descriptions and cleaning and repairing specimens, 53,954 specimens have been actually added during the year. It is of note that nearly half of these additions represent Oriental specimens sent to Dr. Merrill for identification and that with the departure of Dr. Merrill, accessions from the Orient will suffer a corresponding shrinkage.

Since a rate of growth similar to this has been in progress for somewhat more than five years, our herbarium cases have become full to their limit or nearly so. We have in use at the present time more than 3,000 temporary cartons of corrugated paper in which all of our Oriental material is stored. The replacement of these paper boxes alone will require about 60 standard herbarium cases

and the future growth of the herbarium for the next decade may be conservatively estimated at 70 additional standard cases. The purchase of these cases and the provision of floor space are becoming matters of major importance.

The number of duplicate herbarium specimens of the higher plants sent out in exchange during the year amounted to the unprecedented total of 45,397. The incoming exchanges of the higher plants have been less than half as numerous. However, these shipments of ours have served to establish a credit balance, which will bring us valuable material in the future, and, even lacking that, have helped to establish a credit balance of goodwill that will be of value for years to come. Duplicates of the lower plants—algae, fungi, mosses, etc.—bring the grand total of outgoing exchanges to 48,260 specimens. Through the efforts of Curator F. J. Seaver, partly by offering publications in exchange for specimens, 11,586 specimens have been added to the collection of fungi, which, with the addition of 302 algae and hepatics, brings the total number of specimens now in the herbarium to 1,826,736.

Mr. E. J. Alexander, Assistant Curator, besides publishing several botanical papers, editing *Addisonia,* supervising numerous water-color paintings and pen and ink sketches, identified nearly 3,000 plants for various visitors and correspondents.

Dr. W. H. Camp, recently of the Ohio State University, was appointed Assistant Curator, effective on October 1. He will devote his attention primarily to North American plants and more especially to the Blueberry Family (Vacciniaceae).

Dr. H. N. Moldenke, Assistant Curator, began a year's leave of absence on October 1, accepting appointment as a Research Fellow of the National Research Council. He will continue his studies of the Verbenaceae at the Royal Botanic Gardens at Kew.

Dr. A. C. Smith, Associate Curator, was on leave of absence from August 16 to December 11, reading a paper at the International Botanic Congress at Amsterdam and devoting the remainder of the time to taxonomic research at the Royal Botanic Gardens, Kew.

Mr. Percy Wilson, Associate Curator, has continued his studies of West Indian plants, making several thousand determinations. During his vacations, he has made extensive collections of seeds of North American plants.

Mr. R. S. Williams, Research Associate in Bryology, has rearranged many of the genera of mosses to conform to the latest ideas as to their classification and has made many determinations for correspondents.

Publications

Six parts of North American Flora have appeared during the year, establishing a record in that respect. There were six numbers of *Mycologia,* edited by Dr. F. J. Seaver, assisted by Mrs. Paul Miller; two of *Addisonia,* edited by Mr. E. J. Alexander, with colored illustrations made chiefly by Miss Margaret Sorensen; two of *Brittonia,* edited by Dr. E. D. Merrill and Dr. H. A. Gleason; and the usual twelve of the *Journal,* in the editing of which your present Director enjoyed the aid of Miss Carol H. Woodward, Mr. Daniel T. Walden, and Miss Rosalie Weikert.

Dr. E. D. Merrill published in Philadelphia in the *Transactions of the American Philosophical Society* a quarto work of 445 pages entitled "A Commentary on Loureiro's Flora Cochinchinensis."

"Plants of the Vicinity of New York" is the title of a book of 284 pages, written by Dr. H. A. Gleason and published by the Garden. This is the first handbook of the higher plants of our own region and it is meeting with an encouraging sale.

Dr. John K. Small, Chief Research Associate and Curator, has enjoyed a year of his accustomed activity in research and the publication of its results. Of special local interest is his privately published book of 285 pages entitled "Ferns of the Vicinity of New York," with numerous illustrations in black and white by Miss Ruth Sinclair George. Dr. Small's intensive studies of the flora of Florida and other southern states are being continued.

Mr. Henry Teuscher, Dendrologist, in addition to publishing numerous signed papers in various periodicals, has been coöperating with Professor Rehder of the Arnold Arboretum and Dr. Gundersen of the Brooklyn Botanic Garden in preparing manuscript for a book to be published this year by the Brooklyn Botanic Garden under the title "American Index of Cultivated Trees and Shrubs."

Public Education

The School for Professional Gardeners, now in its fourth year, has sixty students enrolled, and taxes the capacity of the rooms

of The Horticultural Society of New York, in coöperation with which and with the National Association of Gardeners, the school is maintained. Two thirds of these students are taking the work for credit and are doing admirable work. The extension courses in gardening, to which members are admitted without fees, one in March and another in October and November, continue to be well attended. Eighteen of the nearby garden clubs have taken out sustaining memberships in the Garden, with an annual fee of $25 to avail themselves of certain privileges of memberships, such as the gardening courses and lectures.

The Saturday afternoon free public lectures were given throughout the year, with the omission of three summer months, as during the previous year. The total attendance at the 37 lectures was 3,823, an increase of 399 as compared with 1934, and making the average attendance 103 persons per lecture.

The New York Botanical Garden has continued to coöperate with the Radio Garden Club in giving talks over station WOR, the Botanical Garden's turn coming on the second Friday of each month at 3:30 P. M.

Dr. Forman T. McLean, our Supervisor of Public Education, has continued his inheritance studies and breeding experiments with the fragrant-flowered species of *Gladiolus,* with encouraging results.

In the photographic department, Miss Fleda Griffith, with the assistance of Miss Mazie Milan, has added to our collection 674 negatives, 549 colored lantern-slides and 45 uncolored slides.

Trees and Shrubs

Under the general supervision of Mr. Henry Teuscher, Dendrologist, a group of selected ornamental shrubs, including 184 species and varieties, was planted last spring to the northeast of the traffic circle and occupying a part of the former Fruticetum. In the remaining part of the Fruticetum, towards the railroad, a long-needed clean-up has begun, with the removal of old overgrown shrubs. Young and healthy plants of the same and different species are in reserve for replacements in the spring. A new nursery, occupying a part of the former Fruticetum, has been established and now contains 1,940 woody plants, representing

626 species and varieties. In the Propagating Nursery, 16 carefully prepared beds contain 2,271 woody plants, representing 392 species and varieties, while 3,318 young potted plants are in cold-frames and greenhouses, awaiting transplanting to beds in the spring.

Buildings and Grounds

As was the case last year, it is a pleasure again to report considerable progress in repairs to buildings and developments in the grounds, due largely to the invaluable assistance rendered by the Works Progress Administration and its predecessors. Our outdoor projects originally functioned through the Bronx Borough President, but as from July 1, 1935, they were transferred to the jurisdiction of the Park Department, the old Emergency Work Bureau being at that time superseded by the new Works Progress Administration, operating on the basis of grants for definite projects. The outstanding accomplishment has been the reconstruction of the trench carrying the steam pipes from the Power House to the Museum Building. By means of this trench (more than 1,200 feet in length) repairs can now be made to the steam lines expeditiously and with a minimum expenditure of labor. Formerly a break in the line necessitated digging up large portions of the front lawn. New pipe, magnesia and asbestos pipe covering, and expansion joints are parts of this project which will be installed later.

It may be opportune at this point to mention the need for extensive repairs to our main conservatories known as Range No. 1. Briefly, the roofs are in bad condition, the steel purlins are badly corroded, the ventilating sash, frames, hardware and gear need repair and replacement, comfort stations should be installed and other repairs of a general nature should be made. As our buildings are owned by the City of New York, the City should assume responsibility for repairs. Applications to the City for appropriations have been made regularly in our yearly budget requests but have been disallowed on the ground that the finances of the City did not permit the necessary expense. The matter has recently again been placed before the Budget Director of the City and he has assured us of his coöperation. The City has our official application for a grant to cover these repairs and we are hopeful that in one way or another funds will be forthcoming.

A garage for the housing of our trucks and equipment has been a necessity for many years. This much-needed improvement is now well under way, the structure adjacent to the "El" station being in process of reconstruction. When completed the building will provide space for 12 cars and a paint shop, and will be fitted with the conveniences for servicing cars.

Steady progress has been made in the resurfacing of primary paths, which for years have been in bad condition. A good start has now been made, about 2 miles in all having been resurfaced. Several thousand yards of material are now on hand and we hope, during the coming spring and summer, to finish all major paths.

Worthy of special mention is the virtual completion of repairs and general renovation and painting of the interior of the entire Museum Building. This work, started over a year and a half ago, has been a major undertaking. Of equal importance, the building has been provided with a new slag roof resulting in a watertight condition. A similar roof was installed over the main power house and the interior was replastered and painted. Much still needs to be done to put the Museum Building in proper repair, such as repainting all brick work on the outside and refitting and weatherstripping of windows, but we are hopeful that with the return of warmer weather these further repairs may be undertaken.

A root-cellar for the storage of bulbs during the winter has been erected adjacent to Range 2. If space permitted, many other completed or partially completed projects would be worthy of extended comment. I merely make mention of the following: construction of a retaining wall 483 feet long along the river road, north of the cherry grove; construction of a substantial stone wall along the Bronx River bank in the north meadow, now about half completed and to be 600 feet long; the entrance road at Southern Boulevard widened and two large piers moved north 110 feet; shed for storage of manure constructed at north end of grounds; walls and fence enclosing new Rock Garden completed; the construction of a soil-sterilizer; retaining wall and benches installed at 204th Street entrance; aquatic house in Range 1 renovated, with old bridge removed and new platform for visitors provided; nursery radically improved in many respects and parking place provided; banks of Bronx River treated at various points; 3,000 yards of fill procured free of cost and dumped in Long Lake

Valley, and new drainage and catch basins installed at various points.

Seed Exchanges

The second organized seed exchange, in 1935, resulted in sending out more than 6,000 packages of seeds to 134 botanical gardens, other institutions, and private individuals, and in the receipt of 4,730 packages in return.

Library

The Library, in charge of Miss Sarah H. Harlow, showed an increase of 667 bound volumes over the preceding year, making the total at the end of 1935, 44,726 volumes. Of the 667 increase, only 98 volumes, outside of continuations of periodicals, were acquired by actual purchase, which unfortunately means that the library, under its current budget, is having some difficulty in keeping up with the procession in the matter of acquiring the newer books, especially the more expensive ones.

Dr. John Hendley Barnhart, Bibliographer, has continued to place his unrivaled knowledge of botanical literature at the service of his colleagues and of numerous inquiring botanists in the United States and in other parts of the world.

Outside Exhibitions

At the International Flower Show, held in New York in March, Mr. T. H. Everett, with the assistance of Mr. E. J. Alexander and Mr. A. C. Pfander, was responsible for the planning and staging of an attractive and educational exhibit of South African plants, including many recently brought from that region by Mrs. Jerome W. Coombs of our Advisory Council. This exhibit was awarded two gold medals, one by the Garden Club of America and the other by the Flower Show organization itself.

A little later in March, the Botanical Garden set up at the Philadelphia Flower Show an exhibit of the origin of the principal foodplants of the world, along the lines of an exhibit designed by Director E. D. Merrill a few months previously, and for which the Horticultural Society of New York had awarded the Garden a gold medal. It was awarded a silver medal in Philadelphia.

At the show of the Horticultural Society of New York, held November 8-10, the Garden was awarded a bronze medal for its exhibit of a large collection of outdoor roses, in bloom at that late season.

Assistance from Works Progress Administration

We acknowledge, with gratitude, very material assistance from the Works Progress Administration and its predecessor, the Public Works Administration. In the report of Director Merrill, one year ago, the total cost of various relief projects for the benefit of The New York Botanical Garden, including wages and material, was placed at $180,000. We have been unable, thus far, to obtain a complete report for 1935, but by piecing together fragmentary reports, we have reason to believe that the Works Progress Administration and allied organizations have expended upon The New York Botanical Garden during 1935 between $200,000 and $250,000. Besides the outdoor projects, like the tunnel for the steam-pipes, we have had numerous indoor workers, mostly women, who have rendered helpful service as artists, stenographers, typists, technicians, clerks, herbarium assistants, etc.

Memberships

The membership lists show that 62 new members were enrolled during the year and that 80 were lost by death and resignation, making a net loss of 18, which, while deplorable, is encouraging as compared with a net loss of 140 during the previous year. The dues collected during the year amounted to $11,470.

There are at the present time 98 Life Members, 5 Fellowship Members, 96 Sustaining Members, and 1,214 Annual Members.

Conclusion

While I have indicated a few particulars in which expansion is highly desirable and in which repairs are more or less urgent, I refrain, in view of the general financial situation, from making any pressing recommendations. If sufficient funds are not forthcoming, from sources not at the moment clearly foreseen, we shall, of course, continue to do the best we can with what we have, and shall continue to hope for bigger and better things in the future.

Marshall A. Howe.

New York, N. Y.,
January 1, 1936.

TREASURER'S REPORT FOR THE YEAR ENDING DECEMBER 31, 1935

EXHIBIT I

BALANCE SHEET

December 31, 1935

JOHN L. MERRILL, Treasurer

Assets

Permanent Fund Assets:			
Investments at cost or appraisal at time of acquisition (Exhibit III)	$2,439,918.31		
Cash awaiting investment	62,484.12		
		$2,502,402.43	
Balance of permanent fund assets expended for current uses (see current fund liability, per contra)		4,954.65	
			$2,507,357.08
Current and Working Assets:			
Cash in banks and on hand:			
For general purposes	$ 8,932.02		
For special purposes	6,465.09		
		$ 15,397.11	
Accounts receivable—city maintenance		16,860.67	
Interest and dividends receivable (Exhibit III)		29,645.99	
Prepaid insurance premiums, etc...		961.59	
			62,865.36
			$2,570,222.44

To the Board of Managers of
The New York Botanical Garden:

We have made an examination of the balance sheet of The New York Botanical Garden as at December 31, 1935, and of the statement of operations for the year 1935. In connection therewith, we examined or tested accounting records of the Garden and other supporting evidence and obtained information and explanations from officers and employees of the corporation; we also made a general review of the accounting methods and of

EXHIBIT I

BALANCE SHEET

December 31, 1935

LIABILITIES

Permanent Funds (Exhibit IV):			
Restricted endowments		$ 228,000.10	
Unrestricted endowments, including bequests set aside by the Board of Managers as permanent funds		2,258,198.16	
Special endowment with life interest in respect of income therefrom..		21,158.82	
			$2,507,357.08
Current Liabilities and Special Funds:			
Current liabilities:			
Accounts payable		$ 5,107.39	
Special funds (Exhibit V):			
Unexpended income from restricted funds	$ 4,637.30		
Unexpended contributions set aside by the Board of Managers for specific purposes	1,827.79		
		6,465.09	
Deferred income credits:			
Membership dues paid in advance	$ 250.00		
Subscriptions and fees paid in advance	953.00		
		1,203.00	
Balance of indebtedness to permanent funds for expenditures of fund assets for current uses		4,954.65	
Working fund:			
Working fund at December 31, 1934	$ 35,494.99		
Add—Excess of unrestricted income over expenditures for the year ending December 31, 1935 (Exhibit II)	9,640.24	45,135.23	
			62,865.36
			$2,570,222.44

the income and expense accounts for the year, but we did not make a detailed audit of the transactions.

In our opinion, based upon such examination, the attached balance sheet (Exhibit I) and related statements (Exhibits II to V, inclusive) fairly present its position at December 31, 1935, and the result of its transactions for the year.

PRICE, WATERHOUSE & Co.

56 Pine Street, New York, March 23, 1936.

EXHIBIT II

Statement of Operations for the Year Ending December 31, 1935

		Total	Restricted and special funds	Unrestricted
Income:				
Income from investments of permanent funds		$116,492.52	$ 10,892.91	$105,599.61
Contributions:				
City maintenance		207,959.17		207,959.17
Other		765.00	325.00	440.00
Membership dues:				
Annual		9,165.00		9,165.00
Sustaining and fellowship		2,245.00		2,245.00
Sales of duplicate books and sundries		3,374.64	1,029.95	2,344.69
Subscriptions and sales of publications		9,887.21	5,717.45	4,169.76
Total income		$349,888.54	$ 17,965.31	$331,923.23
Expenses:				
Horticulture:				
Salaries	$53,374.79			
Plants, seeds, supplies, etc.	6,339.25			
		$ 59,714.04	$ 3,471.43	$ 56,242.61
Science and curating:				
Salaries	$ 54,780.57			
Specimens, supplies, etc.	3,789.54			
		58,570.11	2,074.10	56,496.01
Library:				
Salaries	$ 8,397.36			
New books, periodicals, etc.	2,909.57			
		11,306.93	2,593.63	8,713.30
Education:				
Salaries	$ 8,804.47			
Instruction, lectures, etc.	3,746.03			
		12,550.50	1,289.82	11,260.68
Publications:				
Printing, mailing, etc.		14,644.82	8,011.12	6,633.70
Administration:				
Salaries	$30,180.60			
Stationery, telephone, postage, etc.	9,820.20			
		40,000.80	341.41	39,659.39
Care and upkeep—Grounds:				
Salaries	$37,377.56			
Wages	26,676.35			
Supplies, etc.	3,266.60			
		67,320.51		67,320.51
Care and upkeep—Buildings:				
Salaries	$47,466.46			
Fuel, light, power, etc.	26,816.03			
		74,282.49		74,282.49
Improvements and equipment purchases		1,913.30	239.00	1,674.30
Totals:				
Salaries	$240,381.81			
Wages	26,676.35			
Other expenses	73,245.34			
		$340,303.50	$ 18,020.51	$322,282.99
Excess of income or *expenses* for the year		$ 9,585.04	*$ —55.20*	$ 9,640.24

EXHIBIT III

Summary of Investments, December 31, 1935

	Par value (no par value stocks at book value)	Approximate quoted value	Book value	Accrued interest and dividends December 31, 1935	Average yield per year on basis of	
					Quoted value	Book value
					%	%
General funds:						
Bonds	$ 553,300.00	$ 568,664.13	$ 547,719.76	$ 7,185.92	4.71	4.88
Stocks:						
Preferred ..	85,830.00	109,556.25	94,075.00	862.50	4.81	5.60
Common ...	20,268.80	6,706.87	20,268.80			
	$ 659,398.80	$ 684,927.25	$ 662,063.56	$ 8,048.42	4.68	4.84
Sage fund:						
Bonds	$ 552,000.00	$ 561,051.25	$ 503,920.00	$ 7,622.91	4.02	4.48
Stocks:						
Preferred ..	135,611.25	164,070.00	138,873.76	831.25	3.88	4.59
Common ...	73,300.00	158,850.00	101,298.62	2,153.50	4.76	7.47
	$ 760,911.25	$ 883,971.25	$ 744,092.38	$10,607.66	4.13	4.91
Special endowment fund:						
Bonds	$ 96,000.00	$ 105,815.00	$ 95,629.75	$ 1,649.16	4.02	4.45
Stocks:						
Preferred ..	307,500.00	402,756.25	374,319.38	3,412.50	3.95	4.25
Common ...	21,400.00	25,100.50	43,709.03	334.50	4.73	2.72
	$ 424,900.00	$ 533,671.75	$ 513,658.16	$ 5,396.16	4.00	4.16
John D. Rockefeller, Jr., fund:						
Bonds	$ 253,000.00	$ 283,607.50	$ 256,407.75	$ 3,600.00	4.46	4.93
Preferred stocks	214,137.50	286,825.00	247,325.01	1,993.75	4.32	5.01
	$ 467,137.50	$ 570,432.50	$ 503,732.76	$ 5,593.75	4.39	4.97
Special trust fund:						
Common stock	$ 16,371.45	$ 9,292.50	$ 16,371.45			
	$2,328,719.00	$2,682,295.25	$2,439,918.31	$29,645.99	4.29	4.71

INVESTMENTS

Summary of Average Yields for Year

	On basis of	
	Quoted value	Book value
	%	%
Bonds	4.36	4.72
Stocks:		
Preferred	4.15	4.68
Common	4.38	4.82
	4.29	4.71

EXHIBIT IV

Statement of Permanent Funds Showing Changes During the Year Ending December 31, 1935

	Balance January 1, 1935	Additions	Balance December 31, 1935
Restricted endowments:			
Endowment for science and education....	$ 89,115.49		$ 89,115.49
Addison Brown Fund.....	21,149.31		21,149.31
John Innes Kane Fund.....	35,347.63		35,347.63
Maria DeWitt Jesup Fund.....	25,000.00		25,000.00
Olivia E. and Caroline Phelps Stokes Fund	5,030.63		5,030.63
Charles Budd Robinson Fund.....	755.04		755.04
The H. H. Memorial Fund.....	5,000.00		5,000.00
Alexander P. Anderson and Lydia Anderson Fund	10,000.00		10,000.00
Students' Research Fund.....	9,802.00	$ 360.00	10,162.00
Endowment for the publication of "Mycologia"	1,000.00	1,000.00	2,000.00
Nathaniel Lord Britton and Elizabeth Gertrude Britton Fund.....	20,000.00	4,440.00	24,440.00
	$ 222,200.10	$ 5,800.00	$ 228,000.10
Unrestricted endowments:			
Endowment Fund	$ 241,255.29	$ 436.89	$ 241,692.18
David Lydig Fund.....	34,337.86		34,337.86
William R. Sands Fund.....	10,000.00		10,000.00
Darius Ogden Mills Fund.....	48,099.17		48,099.17
Henry Iden Fund.....	10,000.00		10,000.00
Fanny Bridgham Fund.....	30,000.00		30,000.00
Francis Lynde Stetson Fund.....	25,000.00		25,000.00
Russell Sage and Margaret Olivia Sage Memorial Fund	783,109.96	4,857.99	787,967.95
Frances Griscom Parsons Fund.....	2,304.67		2,304.67
Special Endowment Fund.....	524,894.24	2,551.75	527,445.99
The John D. Rockefeller, Jr. Fund.....	505,964.00		505,964.00
The Charles Patrick Daly and Maria Lydig Daly Fund	19,636.34		19,636.34
The James A. Scrymser and Mary C. Scrymser Fund	12,750.00		12,750.00
The George N. Best Fund.....	3,000.00		3,000.00
	$2,250,351.53	$ 7,846.63	$2,258,198.16
Special endowment:			
Special Trust Fund.....	$ 21,158.82		$ 21,158.82
	$2,493,710.45	$13,646.63	$2,507,357.08

EXHIBIT V

Special Funds

Statement of Application of Income from Restricted Permanent Funds and Special Funds Designated for Specific Purposes

	Balance January 1, 1935	Additions	Expenditures	Balance December 31, 1935
Restricted permanent funds:				
Endowment for science and education:				
Public lectures and instruction, research and publications other than "Addisonia"	$ 321.81	$ 4,318.24	$ 3,377.18	$1,262.87
Addison Brown Fund:				
Publication of "Addisonia"	108.53	2,065.11	2,059.48	114.16
John Innes Kane Fund:				
Plant purchases and expenses	2,460.44	1,713.63	2,552.64	1,621.43
Maria DeWitt Jesup Fund:				
Botanical collections and binding of books	100.90	1,211.96	1,050.14	262.72
Olivia E. and Caroline Phelps Stokes Fund:				
Investigation and preservation of native plants	689.16	246.80	890.00	45.96
Charles Budd Robinson Fund:				
Exploration	59.45	36.55	96.00	
The H. H. Memorial Fund:				
Development of model gardens		242.39	239.00	3.39
Alexander P. Anderson and Lydia Anderson Fund:				
Research	468.54	485.86	337.50	616.90
Students' Research Fund:				
Scholarships and prizes	234.01	485.80	625.00	94.81
Mycologia Fund—				
Publication of "Mycologia"	516.58	4,727.03	4,749.54	494.07
Nathaniel Lord Britton and Elizabeth Gertrude Britton Fund:				
Research, exploration, publication, purchase of plants, books, specimens, etc.	238.67	1,076.99	1,194.67	120.99
	$5,198.09	$16,610.36	$17,171.15	$4,637.30
Special funds contributed for specific purposes:				
Fees from school for gardeners	$1,089.44	$ 1,029.95	$ 655.82	$1,463.57
Sale of shares in the Southern Appalachian Expedition	185.08			185.08
Contribution from National Research Council:				
For the special study of grapes		200.00	143.21	56.79
Other restricted contributions	47.68	125.00	50.33	122.35
	$1,322.20	$ 1,354.95	$ 849.36	$1,827.79
	$6,520.29	$17,965.31	$18,020.51	$6,465.09

BREEDING FOR HARDY SEEDLESS GRAPES

The frontispiece plate[1] in this number of the JOURNAL illustrates a cluster of the fruit borne by a new hardy seedless grape which has been named the BRONX SEEDLESS GRAPE. The berries are of rather large size for seedless grapes, red in color, sweet, of excellent quality and flavor, and the aborted seeds which they contain are soft and pulpy. The clusters are well filled, of good or almost large size, and the fruit is fully ripe early in September. The vine is vigorous in growth, productive, and at least as hardy as most varieties of seeded grapes now grown in central New York. This new grape is judged to be one of the best of the seedlings which bear seedless fruits and which have thus far been obtained in this particular breeding.

The Project: With the permission of the authorities of The New York Botanical Garden[2] the writer has, since 1919, coöperated with the Department of Pomology of The New York State Agricultural Experiment Station at Geneva, New York, in a project which aims (1) to develop hardy seedless grapes of value for culture in a climate such as that of central New York, (2) to obtain data on the inheritance of seedlessness in grapes, and (3) to determine by experimental and cytological studies the nature and scope of the various types of seedlessness in grapes. Thus this research seeks to obtain technical information regarding seedlessness in grapes and to use this knowledge in breeding for practical results.

Methods and Material: The first step in this breeding effort was to hybridize the various tender seedless grapes of the *Vitis vinifera* group, long known in horticulture (the Corinth Grapes, the Thompson Seedless or Sultanina, and the Black Monukka), with hardy seeded grapes selected from the extensive collection grown at the Experiment Station at Geneva. These tender seedless grapes were obtained and grown, with indifferent results, in

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[1] The painting was made by Miss Eleanor Clarke whose services have been available to The New York Botanical Garden under the auspices of the Works Progress Administration of the Federal Government. This plate was made for a technical bulletin on "Seedlessness in Grapes" which is in process of publication by The New York State Agricultural Experiment Station and is here used by courtesy of the officials of that Station.

[2] Stout, A. B. Studies of grapes in coöperation with the State Experiment Station at Geneva, N. Y. Jour. N. Y. Bot. Gard. **22**: 148-156. 1921.

vineyard culture. But they were also planted in courts between greenhouses at The New York Botanical Garden and later also at Geneva, and under such partial protection the vines thrive and frequently flower at a time when their pollen can be used in breeding. It required several years to grow these seedless grapes, to use them in breeding, and to grow the first hybrid seedlings to fruiting age.

The Results: Some of the seedlings of the *first* generation of these hybrids bear seedless fruit and this is especially the case when Sultanina or Black Monukka is the pollen parent. As a rule, many of the seedlings are tender or weak and fail to live to a fruiting age. Many of those that are hardy bear seeded fruits. The first seedling to yield seedless berries fruited in 1926 and descriptions of it were published[3, 4]. Other vines which yield seedless fruit were obtained later, especially among the seedlings that fruited in 1932[5] and 1935.

Further breeding, in part already accomplished, involves (1) the use of the best of the new seedless seedlings as pollen parents in crosses with seeded varieties and with sister seedlings that are seeded and (2) the use of the best of the seeded seedlings in selfing, in intra-crossing and as seed parents in back-crosses with the *vinifera* seedless grapes. Thus, progenies of later generations are obtained, some of which have two or more generations of seedless parents in the pollen-parent ancestry.

The number of seedlings already obtained which bear seedless fruit is now 83 and of these about 20 possess a combination of desirable qualities. The plants are hardy, at least for the average winter at Geneva; the clusters of fruit are well filled and of good or even large size; the fruits are of good flavor and quality, they ripen at Geneva, and the stenospermic seeds which they contain are soft and not noticeable when the fruits are eaten. There is considerable variation in the color, precise quality, and flavor of the fruit, and in various characteristics of the vine. Thus a number of clonal varieties may be selected which afford considerable diversity.

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[3] Stout, A. B. A new seedless grape. Jour. N. Y. Bot. Gard. **28**: 20-23. 1927.

[4] Stout, A. B. A new hardy seedless grape. Jour. Heredity. **19**: 316-323. 1928.

[5] Stout, A. B. New hardy seedless grapes. Science II. **77**: 310, 311. 1933.

The results already obtained fully demonstrate that hardy seedless grapes of merit may be produced by the methods of breeding employed in this research. Also there are now several hundred excellent seedlings, including seeded and seedless, which have seedlessness in their ancestry. Thus valuable material has been accumulated for use in further selective breeding in the effort to obtain the various combinations of characters which give greatest possible value in new hardy seedless grapes.

Technical Studies: Coincident with the breeding work there have been technical studies and an experimental analysis of the various types of seedlessness in grapes, of the sterilities and fertilities, and of the conditions and factors involved in the production of fruit. The results of these studies have now been presented in a technical bulletin entitled "Seedlessness in Grapes" which is published by The New York State Experiment Station. It comprises sixty-eight pages of printed matter, eight plates of halftone reproductions and the color plate showing a cluster of fruit of the "Bronx Seedless" Grape which is also presented in this issue of the JOURNAL. Some of the paragraphs which summarize the subject matter of this bulletin may here be given as follows:

"In considering the character of the fruits and the seeds of grapes it is necessary to recognize that the unit for the production of a seed is the ovule; that the unit for a fruit is the ovary with its complement of ovules; that the flower is a unit in respect to the relative development of the stamens and pistil; and that the unit in vineyard culture is the individual plant of a clone with its clusters of flowers and fruit."

"In grapes there are three main types of ovules: (*A*) abortive at some stage and unable to function in fertilization; (*B*) functional in fertilization but the seeds abort during development—a condition here termed *stenosperm*y; and (*C*) able to develop by apogamy or after fertilization into a hard seed which may or may not contain an embryo."

"The 'seedless' fruits of grapes are of two main types: In one type, exemplified by the Corinth Grapes, the ovules are abortive and the fruits develop without fertilization and are entirely seedless, a condition known as *parthenocarpy*. In another class, exemplified by the Sultanina Grape, the fruits contain one or more soft, pulpy, and aborted seeds formed from ovules in which fertilization occurred, a condition here designated *stenospermocarpy*."

"For the typical stenospermic seed the abortions appear soon after fertilization in the feeble formation of sclerenchyma (hard tissue) and of other tissues which combine to give shape, size, and character to the seed. The endosperm and the embryo remain in a partly developed state and the largest seeds in the mature berries are undersized, abnormal in shape, and soft and pulpy."

"In grapes the entirely seedless fruits of the parthenocarpic type are of smaller size than stenospermocarpic fruit and hence the latter is the more valuable type in the production of new seedless grapes."

"In certain grapes the fruit is seeded or stenospermocarpic (according to the individual) when there is proper pollination but seedless when there is no pollination. In such cases the parthenocarpy is a facultative condition. This is one of the various combinations of conditions which result in mixtures of two or more kinds of berries in a single cluster of fruit."

The Distribution of the New Seedlings: It should perhaps be mentioned that the many seedlings obtained in this breeding project are grown and cared for at the New York State Agricultural Experiment Station. The selections are propagated and tested at the Station and they will be distributed to the public from the Station through the agency of The New York State Fruit Testing Association. The New York Botanical Garden does not undertake to propagate any of these seedling grapes. Thus far two selections have been given horticultural names but it is expected that others will be named and distributed in the near future.

A. B. Stout.

MEDITERRANEAN EXHIBIT AT FLOWER SHOW WINS GOLD MEDAL FOR GARDEN

A gold medal was awarded to The New York Botanical Garden at the International Flower Show in New York March 16-21, for a display of plants of the Mediterranean regions and the Canary Islands, the purpose of which was to show the part played by these sections of the world in contributing to the gardens of today.

This was the third successive year in which the Garden had displayed plants from a specific region, South African subjects

Mediterranean plants as exhibited by the Botanical Garden at the International Flower Show in March

having been shown last year and Californian in 1933. Both of these exhibits contained many subjects which were new to growers. This year, however, familiar garden flowers, some of which had been known in cultivation for hundreds of years, dominated the exhibit.

Several types of narcissi and tulips—original species and cultivated varieties—were shown, as well as crocuses, snowdrops, grape-hyacinths, and other hardy spring-blooming bulbs. Two greenhouse-flowering bulbs were also included—the so-called Cuban lily or hyacinth of Peru (*Scilla peruviana*) which, despite its name, is a Mediterranean native, and the Arabian star-of-Bethlehem (*Ornithogalum arabicum*), both of which the Garden has featured in previous exhibits.

Most of the plants in The New York Botanical Garden's display were selected varieties and hybrids, as would be expected among plants so long in cultivation. The wallflowers and stocks, for instance, are far different from the original sparsely flowered species from which today's garden forms have been derived. Sweet-peas, which are thought to be natives of Sicily, have been developed into more than a thousand varieties in little more than the last half century. They have no doubt been in cultivation, however, for several hundred years.

Some of the other common garden flowers which were seen in improved forms in the Mediterranean exhibit were mignonette, sweet alyssum, snapdragon, anchusa, lupine, annual chrysanthemum, cornflower or bachelor-buttons, leopard's-bane, lavender, linaria, statice, and several of the gray-leaved subjects commonly known as "dusty miller"—actually species of *Centaurea, Senecio,* and *Artemisia.*

From the Canary Islands the most important contribution on display was the cineraria (*Senecio cruentus*) in highly developed varieties, of which tones of blue were selected for the Flower Show.

Among the background and accent plants used were Italian cypresses, a Canary Island palm, oleander, a snowball bush, rock-rose, florist's genista (*Cytisus*) and mimosa (*Acacia*). Along the border, the creeping nettle (*Helxine Soleirolii*), a tender plant from Corsica and Sardinia, made a fine flat ground-cover of bright green.

NEW FELLOWSHIP FUND ESTABLISHED THROUGH ADDITION TO ANDERSON GIFT

Establishment of a permanent research and fellowship fund through an additional gift from Alexander P. Anderson has recently been consummated for The New York Botanical Garden.

Dr. Anderson and his wife, the late Lydia Anderson, had previously given the Garden $10,000, the income from which has been used for research in the laboratories and gardens of the institution. This year Dr. Anderson has offered to add $15,000 to the original gift, extending the purposes of the grant to include fellowships for students. The desire is that the combined income from these sums shall be used both for research in the plant sciences and to finance fellowships for research workers, preferably college and university graduates, who are pursuing their advanced studies at The New York Botanical Garden. Several scholarships now are granted annually by the Botanical Garden. This additional sum of money will make it possible for the institution to finance more adequately the work of young scientists who are investigating important botanical problems.

It was while he himself was a research worker at the Botanical Garden in Bronx Park that Dr. Anderson discovered the puffed rice and puffed wheat that are now on the market.

The new gift of $15,000, according to the agreement drawn between Dr. Anderson and the Botanical Garden, is to be paid in such amounts and at such times as the donor may determine during his lifetime; the balance, if any, to be paid after his death. The whole fund is to be known as The Alexander P. Anderson and the Lydia Anderson Research and Fellowship Fund.

THE BRITTON BEQUEST

Under the terms of the will of the late Dr. Nathaniel Lord Britton, founder and director of The New York Botanical Garden from July 1, 1896, to August 1, 1929, The New York Botanical Garden receives a one-sixth share of the residuary estate.

The Garden has already received payment of $37,900 and more is expected when the estate is fully liquidated.

According to a deed of trust executed prior to his death, Dr. Britton stipulated that the amounts received from the estate are to

constitute The Nathaniel Lord Britton and Elizabeth Gertrude Britton Fund, which is to be kept as a separate endowment fund, the income from which is to be made available for botanical and horticultural research, exploration and publication, and increase of collections of plants, books, and specimens, but not for maintenance or construction.

BOTANICAL GARDEN TO HANDLE NEW REPRINT OF "ILLUSTRATED FLORA"

Further following out the terms of the will of the late Dr. Britton, by which he left his share of the proceeds of the sale of the "Illustrated Flora of the Northern United States and Canada" to The New York Botanical Garden, the Garden this month takes over the future sale of the books.

This three-volume work, written by Nathaniel Lord Britton and Addison Brown and first published by Charles Scribner's Sons, has steadfastly been a "best-seller" among popularized but scientific treatments of flowering plants. It contains descriptions and illustrations of 4,666 species.

A new printing has just been issued by the Garden (in conjunction with the Addison Brown estate), to meet the continued demand for the books. The set will be sold, as formerly, for $13.50.

Orders for the "Illustrated Flora" will be shipped postpaid by the Garden.

PLANTS OF FUCHSIA MAGELLANICA AVAILABLE

Plants of *Fuchsia magellanica,* the hardy fuchsia described in the December JOURNAL, are now available for members of The New York Botanical Garden.

Plants will be distributed on Tuesday and Wednesday, May 11 and 12, to those members who inform the Garden by May 4 that they wish specimens. It is expected that two plants will be available for each.

Members living more than 50 miles away from the Botanical Garden may have the plants shipped. Otherwise, they will be distributed only from the Propagating House, just south of the Allerton Avenue entrance, on the east side of the grounds.

A signed postcard or letter addressed to The New York Botan-

ical Garden, Bronx Park, New York City (Fordham Branch P.O.), saying merely, "Please save specimens of *Fuchsia magellanica* for me," is sufficient to reserve plants for members.

NOTES, NEWS, AND COMMENT

The collection of Myxomycetes has been rearranged recently by Mr. Robert Hagelstein, Honorary Curator of Myxomycetes. All specimens have been examined and the determinations corrected where found necessary. The specimens have been arranged by species and have been numbered, then catalogued on species cards which carry the locality, collector's name, and the specimen number. The collection consists of more than 5,000 boxed and numbered specimens, representing about three quarters of the world's known species. There is a large amount of duplicate material available, and Mr. Hagelstein would like to correspond with other students who may have specimens for exchange. It is possible, from the collection, to assemble up to 150 species of the Myxomycetes of the eastern United States.

Athens, Greece, is the scene of the third International Congress of Comparative Pathology, which is taking place April 15-18. Prof. J. Politis of the University of Athens is president of the section on phytopathology. Previous congresses have been held in Paris, the first in 1912; the second in 1931. Visits to the ancient monuments of Greece are planned for the members attending this year's session.

Mr. C. E. Foweraker, lecturer in forestry and botany at Canterbury College, Christchurch, New Zealand, who is visiting botanical institutions in the United States, addressed the Torrey Botanical Club at The New York Botanical Garden March 18, giving an illustrated talk on the forests of the south island of New Zealand.

The following visiting botanists registered in the library during the winter: Dr. E. D. Merrill, Cambridge, Mass.; Dr. C. Edward Behre, New Haven, Conn.; Dr. R. S. Breed, Geneva, N. Y.; Prof. H. M. Fitzpatrick, Dr. Roy T. Clausen, Dr. W. Lawrence White and Dr. Alton A. Lindsay, Ithaca, N. Y.; Dr. Edgar T. Wherry, Philadelphia, Pa.; Dr. Bessie B. Kanouse, Dr. William C. Steere and Dr. Don V. Baxter, Ann Arbor, Mich.; Dr. T. D. Mallery, Tucson, Ariz.; and Mr. Yao Tang, Peiping, China.

PUBLICATIONS OF THE NEW YORK BOTANICAL GARDEN

An Illustrated Flora of the Northern United States and Canada, by Nathaniel Lord Britton and Addison Brown. Three volumes, giving descriptions and illustrations of 4,666 species. Second edition, reprinted. $13.50.

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pages and 601 figures. 1932. Price, $5.50 postpaid.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages. 1935. $1.65.

Flora of Bermuda, by Nathaniel Lord Britton and others. 585 pages with 494 text figures. 1918. $3.50.

A Text-book of General Lichenology, by Albert Schneider. 230 pages: 76 plates. 1897. $2.50.

Mycologia, bimonthly, illustrated in color and otherwise; devoted to fungi, including lichens, containing technical articles and news and notes of general interest. $6.00 a year; single copies $1.25 each. Now in its twenty-eighth volume. Twenty-four Year Index volume $3.00 in paper, $3.50 in fabrikoid.

Addisonia, semi-annual, devoted exclusively to colored plates accompanied by popular descriptions of flowering plants; eight plates in each number, thirty-two in each volume. Subscription price, $10.00 a volume (two years). [Not offered in exchange.] Now in its nineteenth volume.

North American Flora. Descriptions of the wild plants of North America, including Greenland, the West Indies, and Central America. Planned to be completed in 34 volumes, each to consist of four or more parts; 81 parts now issued. Subscription price, $1.50 per part; a limited number of separate parts will be sold for $2.00 each. [Not offered in exchange.]

Brittonia. A series of botanical papers. Subscription price, $5.00 per volume. Now in its second volume.

Contributions from The New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above. Price, 25 cents each. $5.00 per volume. In the fourteenth volume.

Memoirs of The New York Botanical Garden. Price to members of the Garden, vols. I-VI, $1.50 per volume; to others, $3.00. Vol. VII, $2.50 to members; to others, $5.00. Vol. I. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Per Axel Rydberg. Vol. II. The Influence of Light and Darkness upon Growth and Development, by D. T. MacDougal. Vol. III. Studies of Cretaceous Coniferous Remains from Kreischerville, New York, by A. Hollick and E. C. Jeffrey. Vol. IV. Effects of the Rays of Radium on Plants, by Charles Stuart Gager. Vol. V. Flora of the Vicinity of New York, by Norman Taylor. Vol. VI. Twentieth Anniversary of The New York Botanical Garden. Vol. VII. Includes New Myxophyceae from Porto Rico, by N. L. Gardner; The Flower Behavior of Avocados, by A. B. Stout; Plants Collected in the Amazon Valley, by H. H. Rusby; and The Flora of the Saint Eugene Silts, by Arthur Hollick.

Journal of The New York Botanical Garden, monthly, containing notes, news, and non-technical articles. Free to members of the Garden. To others, 10 cents a copy; $1.00 a year. Now in its thirty-seventh volume.

Direct all orders to:

THE NEW YORK BOTANICAL GARDEN

Bronx Park, New York, N. Y. (Fordham Branch Post Office)

GENERAL INFORMATION

Some of the leading features of The New York Botanical Garden are:

Four hundred acres of beautifully diversified land in the northern part of the City of New York, through which flows the Bronx River. A native hemlock forest is one of the features of the tract.

Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

Gardens, including a new rock garden, a large rose garden, a perennial border, small model gardens, and other types of plantings.

Greenhouses, containing thousands of interesting plants from America and foreign countries.

Flower shows throughout the year—in the spring, summer, and autumn displays of daffodils, lilacs, irises, peonies, roses, water-lilies, dahlias, and chrysanthemums; in the winter, displays of greenhouse-blooming plants.

A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants; also historic microscopes.

An herbarium, comprising more than 1,800,000 specimens of American and foreign species.

Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

Scientific research in laboratories and in the field into the diversified problems of plant life.

A library of botanical and horticultural literature, comprising nearly 45,000 books and numerous pamphlets.

Public lectures on a great variety of botanical and horticultural topics, continuing throughout the autumn, winter and spring.

Publications on botanical subjects, partly of technical, scientific, and partly of popular, interest.

The education of school children and the public through the above features and the giving of free information on botanical, horticultural and forestral subjects.

The Garden is dependent upon an annual appropriation by the City of New York, private benefactions, and membership fees. Applications for membership are always welcome. The classes of membership are:

Annual Member	annual fee	$ 10
Sustaining Member	annual fee	25
Garden Club Membership	annual fee for a club	25
Fellowship Member	annual fee	100
Member for Life	single contribution	250
Fellow for Life	single contribution	1,000
Patron	single contribution	5,000
Benefactor	single contribution	25,000

Contributions to the Garden may be deducted from taxable incomes. Bequests may be made in the form of securities, money, or additions to the collections. The following is an approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ———.

Conditional bequests may be made with income payable to donor or any designated beneficiary during his or her lifetime.

Fellowships or scholarships either in perpetuity or limited to a definite period may be established for practical student-training in horticulture or for botanical research.

All requests for further information should be sent to

THE NEW YORK BOTANICAL GARDEN
BRONX PARK, NEW YORK, N. Y. (FORDHAM BRANCH POST OFFICE)

VOL. XXXVII MAY, 1936 No. 437

JOURNAL
OF
THE NEW YORK BOTANICAL GARDEN

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ETHEL ANSON S. PECKHAM

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W. H. CAMP

TWENTY-ONE GRADUATE FROM SCIENCE COURSE

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SMALL VOLUMES INTENDED FOR BEGINNERS
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NEW DAFFODILS AND HOW TO USE THEM*

When one uses the term "new" in connection with daffodils in the United States it is only relative, as we are so far behind other countries that what is beginning to be old with them is still new to us. This state of affairs has been caused by two things: a quarantine (37) which was wrongly treated as a tariff and a period with lack of good gardening, caused, I believe, by the newness of the country and the necessity for the population to concentrate upon other things because of the pioneer struggle.

So far as daffodils are concerned, times have changed very materially, and there are now available here many good sorts, whereas thirty-five years ago there were no really new ones except in one or two gardens of amateurs. Even those were not top-notch varieties because of the backward condition of gardening in general, and the majority of people would not think of paying more than fifty cents a dozen for bulbs. When Mr. Chester Jay Hunt began selling by tens for a fixed price, they thought that two dollars and a half for ten was a very large sum. Their hair stiffened at this; then when Mr. Scheepers showed a dozen pots of bulbs at "each" prices (about five dollars for the highest), it rose and remained standing!

How different it is now with the tremendous garden club movement and a daffodil society just formed! The International Flower Show and other spring exhibits had some fine displays of really good varieties of daffodils. Besides, there are many nurseries where good collections are being grown both on trial and for the

* Abstract of an illustrated lecture given at The New York Botanical Garden April 11 by Mrs. Wheeler H. Peckham.

bulbs and flowers. It will pay to visit all of these, some on Long Island, some in New Jersey, some in Gloucester County, Virginia, and some gardens of specialists in the vicinity of Washington, D. C. If you were on the Pacific Coast you would have a fine opportunity to see splendid collections there in the states of Washington and Oregon. Many of the bulbs grown in the Northwest are offered here in catalogues of reputable dealers right in our own New York City. They are good bulbs, as the difficulties of our climate have been overcome and much more is now known about the proper treatment for correct curing and resting.

It is much the most satisfactory way of doing when choosing varieties to go directly to a place where the plants can be seen in bloom. One gets an idea of what is in season together, of relative heights and of combinations of types that look well or contrast well together. I would never think of buying any variety of plant sight unseen on someone else's recommendation. Shows and trial gardens are for us to look at, and the best education for mind and memory is through the eye. It is well to study any group of plants that one spends money on, to learn the suitable soil, the right exposure required by different varieties, and the proper treatment.

Fortunately, daffodils do not need much attention if one puts them in the right place in the beginning. Those in the trumpet group need deep soil and they prefer it of heavier quality than those of the *poeticus* or *Leedsii* groups. The trumpet group also desires full sun for practically all of the day, whereas the others mentioned will do in semi-shade. Giant *Leedsii* varieties need more sun than the flat sorts, and the *incomparabilis* varieties with the large cups also require more sun. Probably these types have more trumpet blood in their ancestry, hence their demands. *Poeticus* sorts like a more moist soil, though it must be well drained. No bulbous plant, in fact, likes to stand steadily in water.

When buying, I would rather invest my money in a few bulbs of the really fine sorts, for they will increase just as rapidly as the poor ones. By adding a few good ones each year, one can have a garden that sets a higher standard than when only one or two varieties of poorer types are planted in quantity to give a quick showing. The varied collection will give a long season of bloom if properly chosen, whereas the other will be all over within a few days.

Photograph by courtesy of M. Van Waveren & Sons, Inc.

FIGURE 1. Mme. Van Waveren is one of the largest among the trumpet daffodils, and is found excellent for every purpose.

Photographs by courtesy of M. Van Waveren & Sons, Inc.

FIGURE 2. Two splendid daffodils. At the left, Killigrew, an *incomparabilis* which has proved itself good in American gardens and shows. Right, John Evelyn, lovely in the garden and useful for variety in show groups.

In selecting the varieties for a well-balanced collection, not only is diversity of style, height, size, and shape to be considered, but also whether the plant is a sturdy grower and whether the flowers remain in good condition for a long time. Have they a strong enough stem to hold up the flowers until they are over? In the flowers we need what we call *substance*, that heaviness of petal, that firmness which allows it to keep in good condition through the sudden changes of cold nights, hot sunny days, dry, strong winds, and heavy rain or even hail. Not only should the shape be good for the variety or type but this *substance* must be present. Then, too, we need clear, fine color, not streaked or faded in places, and a color that also resists strong sun and beating rain.

Flowers should have a *quality*, that indescribable element of outstanding worth that arrests one and that is generally seen even by the novice, though he is unaware of what it is that holds his attention. Size, and the coarseness that is bound to come with size alone, will *not* give quality, for quality is a combination of the best in light, shade, color, shape, balance of form and make-

up, and carriage of the flower, resulting in a dignity, a subtle beauty, that comes only when each attribute is properly blended into the perfect whole.

I would have the would-be daffodil-grower (collector, if you will) learn what these attributes are and what constitutes a good flower, and then select others to plant nearby which will be in harmony, each augmenting the beauty of the other. Planting like this should be done with knowledge, not just adding varieties because they are pure novelties. Let them be new so long as they are better than what you already have, but be sure your discrimination is real, a trained one, and then you will be headed in the right direction.

Here is a list of some of the newer daffodils worth growing:

Trumpet: Golden Harvest, Slieve Bermagh, Alfred Hartley, Mustapha, Morven, Brimstone, Loyalist, Carmel, Honey Boy, Mme. Van Waveren, Beersheba, Lola Leak.

Incomparabilis: Royalist, Aerolite, Pilgrimage, St. Egwin, Golden Frilled, Wheel of Fortune, Coverack Gem, Killigrew, Fortune, Fortune's Cheer, Tregoose, Franciscus Drake, Coverack Perfection, Beauty of Radnor, John Evelyn, Rewa, Orange Glow, Red Cross.

Barrii: Croesus, Sunstar, Rosebud, Quetta, Crucible, Stamboul, Seraglio, Magician, Rodosto, Eva, Firetail, Crimson Braid, Lady Diana Manners.

Leedsii: Silver Star, Sundew, Tenedos, Gertie Millar, Kenbane, Tullia, Silver Salver, Mitylene.

Triandrus hybrids: Harvest Moon, Agnes Harvey, Moonshine, Venetia.

Jonquilla hybrids: Golden Cycle, Trewirge.

Cyclamineus hybrids: Beryl, Golden Sceptre, Solleret.

Tazetta hybrids: Silver Chimes, Golden Perfection, Medusa.

Poeticus: Caedmon, Red Rim, Wide Wing, Sarchedon.

Doubles: Mary Copeland, Twink, Indian Chief, Daphne, Cheerfulness, Valencia.

ETHEL ANSON S. PECKHAM.

THE ANTIQUITY OF HEMP AS AN ECONOMIC PLANT

In the thousands of years since man has been making rational use of the plants in his environment, the climate has, in many cases, so changed over large areas that all traces of the basic, ancestral species have been obliterated. It is therefore probable that we may never know the endemic area of many of our cultivated plants. Excavations incident to anthropological researches have occasionally given clues; in other instances we have been forced to rely on the etymon—the basic root-word—and its vulgar or folk derivatives in related ethnic groups.

In applying this latter method in an attempt to locate the place where hemp (*Cannabis sativa* L.) was first cultivated, the problem is not a simple one, for it seems, even in prehistoric times, to have been recognized as a useful plant throughout most of Asia. It is probable that it was indigenous on at least the Pamir Plains, the cradle of the ancient Aryan peoples, for it followed them in their various migrations. It was also accepted by the early peoples with whom they came in contact, for in each instance it carried a name derived from the same root word.

The name appears in the old Sanskrit as *banga* or *gangika,* and in the modern Indian and Persian as *bang* or *bhang*; in Bengalese it is *ganya*. The Latin *cannabis* is derived directly from the Greek *kannabis* and reappears in the *canapa* of the Italian, *cañamo* of the Spanish, and *canhamo* of the Portuguese. In various parts of Russia, hemp is referred to as *kanaple*, *kunapli*, and *konopel*. The Bohemians refer to it as *konope*, and the Poles as *konop*.

The word *hacnep* appeared in Old English as early as 1150, apparently derived from an Old Teutonic word.

The Germans generally use the word *hanf*; the Danish term is *hamp* and the Swedish *hampa*. The English word is *hemp;* the Dutch, *hennep*. While at first some of the words seem but little related to the common root, a study of obsolete or little-used terms suggests a relationship and common origin, for we find the *cannep*, *kennep*, *hennep*, *hanep*, *hamp*, and *hemp* of the Dutch; the *hennep*, *hannf*, *hanf*, and the occasional *hampf* and *hamp* of the Germans; and the *canabe, canabier, canve*, and *chanvre* of the French.

FIGURE 1. These ten-foot plants are one of the Chinese varieties of hemp from which fiber is obtained. Inconspicuous flowers are borne at the tip of each stalk. The form from which the narcotic drug is taken is a low-growing plant with compact, leafy spikes of flowers.

It is therefore obvious that the Indian, Persian, Bengalese, Greek, Latin, Russian and Germanic words for *hemp,* as well as their many linguistic variations, have been derived from the root *ang* (or *an*) of the ancient Sanskrit *banga.*

It is probable that hemp was introduced into western Europe about 1500 B. C., at the time of the Scythian invasion. It did not come into Europe by way of the Mediterranean, for the ancient Arabs, Hebrews, and Egyptians did not know of the plant until they came into contact with the Persians. It is quite probable, however, that it was reintroduced at various times and from different sources, for certain types or varieties of the plant are grown in different parts of the continent. This distribution of varieties can not be explained entirely by climatic selection, for many of them apparently succeed equally well under various conditions, although the peoples of northern Europe grow varieties which mature in less time than those of the southern part.

There are various reasons for the wide dispersal and introduction of the plant. It is probable, however, that the more important are its value as a fiber plant (FIGURE 1) and its use as a source for the drug hashish, a potent narcotic with intoxicating and aphrodisiac properties. The crude drug is obtained from the flowering stem-tips of the female plant, care being taken that fertilization does not occur. Since hemp is normally dioecious, this is accomplished by removing the male plants from the field. The crude drug, consisting of these flowering stems with their unfertilized flowers, leaves, and bracts, after drying, is generally shredded and used directly, but may be mixed with a "carrier" such as opium or tobacco, or a combination of both. The active drug is associated with the oil and resin of the large glands found abundantly on the structures of the female inflorescence (FIGURE 2). These glands, although present, are not so numerous or well developed on the floral organs of the male or on the vegetative structures of either plant.

The culture of hemp has not been limited solely to the Aryan races, for the Mongol-Tartar peoples have cultivated it since antiquity. The Chinese equivalent for hemp is *ma*, and the more common names are fire-hemp, yellow-hemp and Han-hemp. It is mentioned in the Chinese Shu-King of about 500 B.C., and appears in two earlier works of the Chou Dynasty written about 1050 B.C.

In China various parts of the plant are used in the preparation of medicine. An ancient Chinese pharmacopoeia[1] contains a list of more than one hundred ailments whose cures were supposedly effected by its use, including female weakness, gout, rheumatism, malaria, beri-beri, boils, constipation and absent-mindedness.

Through the courtesy of Mr. Lyster H. Dewey of the United States Department of Agriculture, who supplied the seed, the

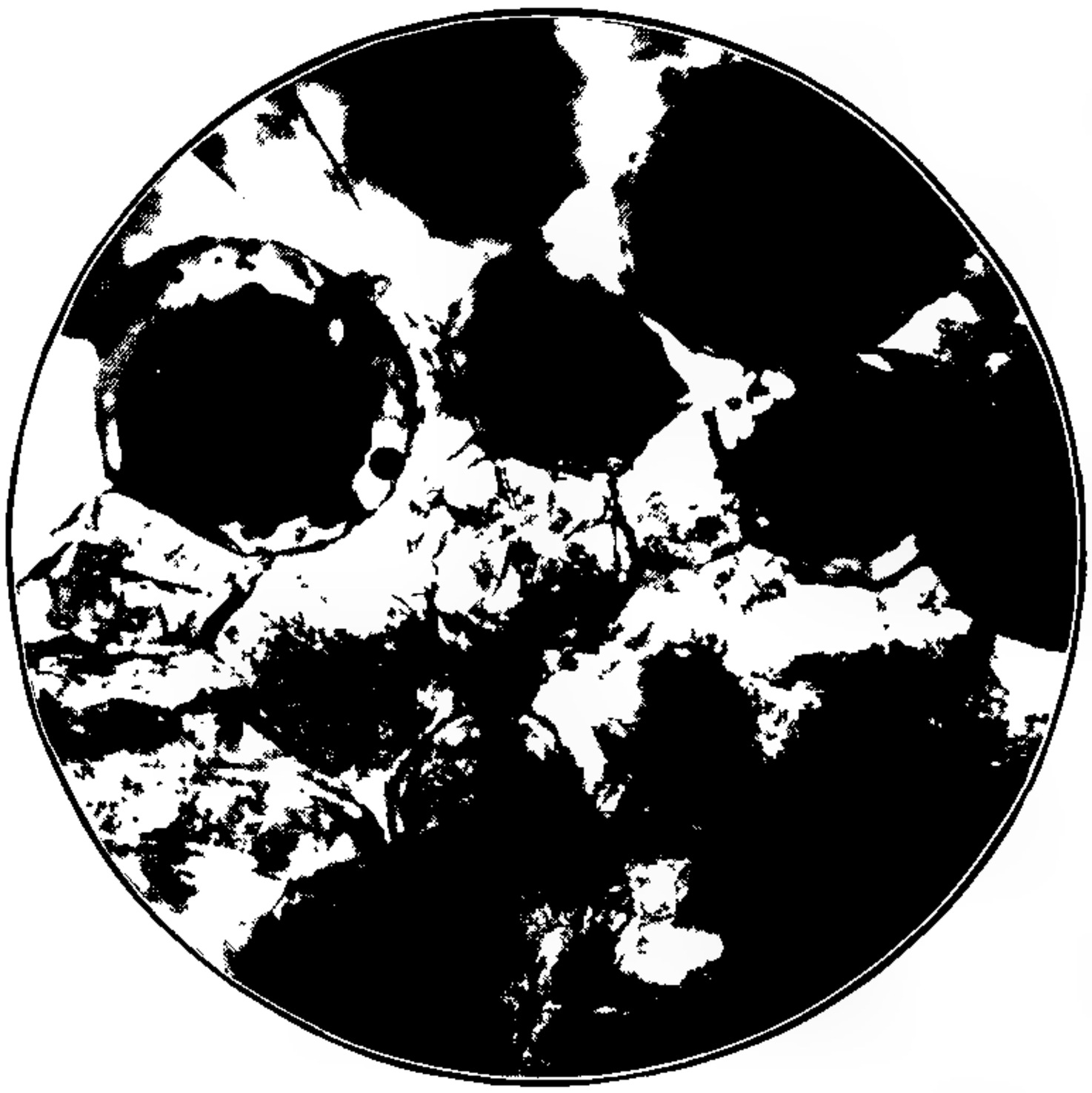

FIGURE 2. Surface view of the bract of a female flower, showing the glands which secrete the narcotic substances, magnified 450 diameters. The lighter glands, which are immature, show the individual cells of secretion in each, while the darker ones show the secreted globules of oil and masses of resin with which the active drug is associated.

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[1] Sheng Nung, et al. Revised classification of medicinal plants. Vol. 22. Shanghai. 1921.

This interesting work is a reprint in ancient characters of the "Chinese pharmacopoeia" supposed to have been first compiled by Sheng Nung about 3000 B.C. Various editors have revised and enlarged it, among them being Yu Chang Wu, about 225 B.C., and Chin Chu Li, about 1500 A.D.

The writer is greatly indebted to Dr. L. C. Li and Dr. C. H. Chung, who translated parts of this and other Chinese manuscripts for him.

writer has been able to grow a number of varieties, the original seed of which was collected in various parts of the world. The plants were grown in adjacent plots for several summer and winter seasons in the garden and greenhouses of the Botany Department of The Ohio State University, and carefully examined for morphological differences. Although the varieties observed differed in size, date of blooming, productivity of seed, quality of fiber, and drug content, the writer found no differences, except in one known mutant, sufficient to separate the various groups (*Cannabis pedemontana, C. chinesis*, and *C. indica*) and prefers to include them all under *Cannabis sativa* L.

Since the various forms of hemp are so similar, although they have been cultivated and differentially selected by various and widespread racial groups since antiquity, it would seem, therefore, that hemp is truly a monotypic genus. And further, since both the Mongol-Tartar and Aryan stocks arose in different areas and both made early use of the plant, it would seem that hemp, in the wild state, was originally distributed over a large portion of temperate Asia, large areas of which are now too arid to support the plant.

W. H. Camp.

TWENTY-ONE GRADUATE FROM SCIENCE COURSE

Certificates were presented to twenty-one graduates of the Course for Professional Gardeners given by The New York Botanical Garden at the headquarters of the Horticultural Society of New York, Monday evening, April 20. This was the third and largest class since the course was organized in the fall of 1932.

Nine of this spring's graduates have been student gardeners at the Botanical Garden. One of them, Howard Swift, was the first exchange student to be sent for a year of work at Kew Gardens in London. Another, Donald Dodds, left the Botanical Garden a few months ago for a new position on a Long Island estate. The others included Joseph W. Tansey, Robert E. Weidner, Stephen G. Cutting, Frank Regan, George W. Lupton, Hildegard Schneider and Kathryn Quinn.

Among the other graduates were Mrs. Rose L. Carlson, Mrs. J. F. Mowbray-Clarke, landscape architect for Rockland County, N. Y.; Charles Meissner, a florist; Jules Bernard and Per H. Thelin, nurserymen; Henry Funk, from the Brooklyn Botanic Garden; and Norman J. Opie, William Sheane, Tage Castenschiold, William Bauer, Carl Schutt, and Christian Wolf, all professional gardeners.

Brief addresses were given by Dr. E. W. Sinnott, representing the Board of Managers; by Kenneth Hadland and John S. Doig, of the National Association of Gardeners; by Edwin Beckett, a former graduate; and by Dr. Marshall A. Howe, Director, who presented the certificates.

STUDENT GARDENERS ON EXCHANGE BEGIN WORK IN NEW YORK AND LONDON

The first exchange student gardeners between The New York Botanical Garden and the Royal Botanic Gardens at Kew in England started their work at these two institutions the last of April.

Howard Swift, who has been working at the Botanical Garden since September 1, 1934, and who this year completed the Course for Professional Gardeners, sailed April 18 on the *American Trader* for London, where he was to begin working and studying at Kew at once.

Meanwhile, C. J. Collins, a student gardener at Kew, was on his way to America to work and study at The New York Botanical Garden, arriving here April 20, just in time to witness the graduating exercises of the student gardeners.

Traveling expenses for the two students are being met by the English Speaking Unions in England and America. The New York organization recently gave a series of lectures on gardens of foreign countries in order to raise the fund for the trip. Both student gardeners will be paid allowances while they are pursuing their work away from home.

This exchange of students between the two countries is part of

a broad program being launched by The New York Botanical Garden in order to give American gardeners the finest possible training, with the opportunity of study abroad for picked men. At the same time, a selected student gardener from Kew will be given the privilege of broadening his experience by working in America.

The scholarships which make possible this exchange of student gardeners are for the duration of one year.

The New York Botanical Garden's Science Course for Professional Gardeners, inaugurated in the fall of 1932 in order to give student gardeners a firm background in the sciences underlying their work, is part of the institution's plan for broadening the training of men who come under its supervision. The course has been modeled upon similar courses given at botanic gardens abroad.

WITH OUR COLLABORATORS

Among the interesting herbarium specimens sent to the Garden this year by Dr. Delzie Demaree is a fine series of the midland fawn-lily (*Erythronium mesachoreum*) from Oklahoma. This species, whose perianth segments are tinted with deep lavender, is quite distinct from the white fawn-lily (*Erythronium albidum*) and ought to be tried in our eastern gardens.

Mr. T. MacDougall has recently returned from Mexico with another of his valuable collections. Since 1934, Mr. MacDougall has been spending the winter seasons on the Isthmus of Tehauntepec and in the state of Chiapas, and has brought back some hundreds of living plants, mainly orchids, bulbous plants, cacti and other succulents, as well as numerous seed collections of plants having horticultural possibilities. Although the majority of the specimens have not as yet flowered and therefore remain unidentified, a sufficient number have come to maturity to indicate the importance of the collections. Some have already been found to be Central American species heretofore not known from Mexico, and a few others will undoubtedly prove to be new species.

Of particular botanical significance is the rediscovery of *Tagetes Seleri* and *Villadia albiflora,* both of which have apparently been known only from the original collections made during the last century.

The trees and shrubs which he has brought back will, of course, be tender in our climate, but will make valuable additions to our conservatory collections. We look with especial anticipation, however, to the annuals, for some of the more showy ones seem to possess great possibilities as bedding and border plants.

W. H. Camp.

CHAPLAIN JOSEPH CLEMENS

A letter from Mrs. Joseph Clemens, dated January 21, 1936, at Finschhafen, Morobe, New Guinea, addressed to relatives in the United States, brings the sad news of the death of her husband, apparently a day or two previously.

Joseph Clemens was born at St. Just, Cornwall, England, on December 9, 1862, and came to Pennsylvania with his parents in 1867. He received from Dickinson College the degree of A. B. in 1894 and A. M. in 1897, became a Methodist Episcopal clergyman, and in 1902 joined the United States Army as chaplain, with the rank of captain. He was retired for disability in the line of service in France in 1918. In 1894 he was married to Mary Knapp Strong, who was interested in plants and nature-study in general and communicated to her husband a considerable share of her enthusiasm. While stationed at various army posts, especially in California, Utah, Oklahoma, and Texas, Chaplain and Mrs. Clemens made collections of herbarium specimens, but their main activity in the field came after the Chaplain's retirement in 1918. Noteworthy among their later collecting grounds were various parts of the Philippine Islands, from northern Luzon to southern Mindanao and the Sulu Archipelago, including many of the highest and most inaccessible mountains; British North Borneo; Chihli and Shantung provinces, China; Anam, French Indo-China; and, recently, New Guinea. Most of their Oriental collections were studied by Dr. E. D. Merrill, recently Director of The New York Botanical Garden, and their gatherings are well represented in the Garden herbarium. *Clemensia*

Merrill, a genus of Meliaceae, and *Clemensiella* Schlechter, a genus of Asclepiadaceae, commemorate the family. In an article on "Botanical Exploration in Borneo," published in this JOURNAL in August, 1930, Dr. Merrill stated: "The botanical collections made by Mrs. Clemens in the past 25 years exceed 20,000 numbers." In that article, Dr. Merrill published a very interesting letter from Chaplain Clemens, describing the experiences of Mrs. Clemens and himself in plant collecting in Sarawak. In closing the narrative, the Chaplain remarks:

"Yes, it's a strange manner of holiday diversion; especially when we have only the love of wild places as our excuse for doing it, but I married a wife, and she owns part of the time, and chooses this manner of playing the game—and why not?"

Mrs. Clemens plans to continue "playing the game" in far-away New Guinea!

MARSHALL A. HOWE.

A GLANCE AT CURRENT LITERATURE*

Dr. Agnes Arber writes of "A Recent Discovery in Sixteenth Century Botany" in *Nature* for February 15, describing the early herbarium which has lately been unearthed at the Botanical Institute of Bern. Professor Walther Rytz, who has examined the nine folios—one of which consists of 650 woodcuts—has identified the collection as having been made by Felix Platter, a sixteenth century physician who received specimens from Clusius, Gesner, and Camerarius. The herbarium, says Dr. Arber, dates from a period in which the new art of drying plants (taught by the Italian scientist, Luca Ghini) was practised extensively by the savants of the day, who thus laid the foundation of present-day systematics through their mutual exchange of specimens.

Studies in nomenclature of forest trees, their diseases and pests, and the structure and properties of wood are included in the eleventh annual report of the Imperial Forestry Institute of the University of Oxford. Copies of the English edition of the

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* All publications mentioned here—and many others—may be found in the Library of The New York Botanical Garden, in the Museum Building.

new International Classification System for Forest Bibliography, it is announced in this volume, may be obtained for six shillings plus postage from the Librarian, Department of Forestry, Oxford University.

The controversy over whether the Olympic Mountains should be kept as a national forest or made into a national park occupies the bulk of the April number of *American Forests*. The separate articles, which are magnificently illustrated, are followed by an editorial comment.

The supplement plate in the *Gardeners' Chronicle* for February 22 shows *Clematis macropetala,* which is described in that issue by Ernest Markham as one of the six best species for garden cultivation in England. A new pink seedling of *C. macropetala,* called var. *Markhami,* won the Royal Horticultural Society's Award of Merit last year.

"Planting Roses the Modern Way" is the subject of an article in *Horticulture* for April 1, giving sensible, simple, and up-to-date planting directions.

New varieties and interesting arrangements of asters for all seasons are described by Ray M. Koons in the *Gardeners' Chronicle of America* for April. "Azaleas for Spring Glory" are the subject of Paul F. Freese.

Effects of illuminating gas on greenhouse plants, especially gas which comes from city mains, are discussed in the March and April issues of *Nursery Disease Notes* of the New Jersey Agricultural Experiment Station. Symptoms of gas injury on many greenhouse crops comprise part of the work.

A new publication being welcomed by many botanists is *The Journal* of the recently organized Southern Appalachian Botanical Club. Three numbers -January, February and March—have appeared, under the editorship of Earl L. Core. Published at the University of West Virginia, Morgantown, W. Va., this new journal fulfills for the southern Appalachian region the interests served by *Rhodora* and *Torreya* further north.

The much-discussed new two-column format of the *American Journal of Botany* appeared with the January number, 1936. Among the articles in this issue is one by H. A. Gleason and A. J. Panshin describing *Swietenia Krukovii,* a new species of mahogany, specimens of which were collected by B. A. Krukoff on the Jurupary River in Brazil, in 1933, and the type deposited in the herbarium of The New York Botanical Garden.

CAROL H. WOODWARD.

NOTES, NEWS, AND COMMENT

Doctors Marshall A. Howe, R. A. Harper, and B. O. Dodge attended the meeting of the National Academy of Sciences in Washington, D. C., April 27-29, at which Dr. Dodge presented a paper on "Interspecific Crosses Involving Lethals for Ascus Abortion."

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Dr. H. A. Gleason was in Washington April 25 for the meeting of the National Research Council.

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During the Easter holidays, Doctors William C. Steere and Alexander Smith from the University of Michigan spent a week doing research at The New York Botanical Garden. Dr. Steere continued his task of sorting the Mitten collection of mosses, some of which were gathered nearly 100 years ago, and preparing duplicate specimens for exchange, while Dr. Smith worked in the mycological herbarium, making a critical study of some of the types of species of the higher fungi described by Dr. W. A. Murrill.

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Another recent visitor was William R. Van Dersal, of the Soil Erosion Division of the United States Department of Agriculture, who is gathering information on native plants and their usefulness, especially in protecting soil from destruction by water.

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Dr. Mildred E. Mathias returned to the Garden last month to continue her work on the Umbelliferae.

Dr. E. D. Merrill spent several days in April in New York, checking identifications and doing preliminary work on the preparation of duplicate sets of a collection of plants from the Island of Hainan, China. This collection, which consists of 7,500 numbers with from one to ten duplicates of each, was made in cooperation with Sun Yatsen University, and made possible through a gift from Henry W. deForest.

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About forty posters showing diseases and pests of ornamental plants which are in common cultivation have been on exhibit in the Museum Building during parts of February, March, and April. Prepared under the direction of Dr. B. O. Dodge, who lectured April 18 on plant diseases and pests and their control, they have been made by artists employed through the Works Progress Administration.

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Beginning the third week in April, the gates to the Thompson Memorial Rock Garden, in the glade east of the Museum Building, will be open from 10 a.m. to 4:45 p.m. daily. The first extensive display of spring flowers in the rock garden is expected about the middle of May. Meanwhile, however, there will continue to be many individual plants of exceptional interest coming into bloom. Some of these are species new or rare in cultivation, some are recently developed horticultural varieties, and some are native plants being adapted to garden use.

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William Hertrich, Director of the Huntington Botanic Garden in California, visited The New York Botanical Garden April 20, on his way to Europe.

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Henry Teuscher, for the past three years Dendrologist at The New York Botanical Garden, left May 1 for Canada, where he becomes Superintendent and Chief Horticulturist of the newly established Botanical Garden of Montreal. His work there comprises first of all the planning and the preliminary planting and construction at this new institution, of which Frère Marie-Victorin is Scientific Director. Mr. Teuscher was born and educated in Germany, where he received from the Botanical Garden at Berlin-Dahlem the equivalent of a master's degree in this country. He has been in America since 1922, and is a citizen of the United States.

REVIEWS OF RECENT BOOKS

THE GARDEN DICTIONARY*

The Garden Dictionary, edited by Norman Taylor, and published by the Houghton-Mifflin Co., is certainly a notable addition to the literature of American horticulture. Besides an excellent quality of paper, and clean and easily legible press-work, the new book has other desirable features that quickly catch the eye. A feature that appears to be quite novel is a map of each state of the Union and each province of Canada with indications of zones of hardiness. In many of the states these zones run essentially east and west, the northern zones being naturally colder than the southern. However, in California, influenced by the proximity of the Pacific Ocean and a more or less north and south coast line and by the more or less north- and south-ranging mountains, the zones of hardiness run more or less north and south. The zoning system is not original with Mr. Taylor, and not entirely so with Dr. Alfred Rehder of the Arnold Arboretum, who applied it in his "Manual of Cultivated Trees and Shrubs." Mr. Taylor, however, has added a Zone 9 to Rehder's 8, to cover the southern tip of Florida, and has worked out the zone system in much more detail than Rehder and has applied it to each state. The maps of the different states of the Union and provinces of Canada show the average annual rainfall, with regional details in the case of the larger states, such as California, in which the rainfall ranges from 5 inches or less a year in the Death Valley country to 80 inches along the northwest coast, in Del Norte and Humboldt counties.

The book includes 11,300 alphabetically arranged entries, including non-technical descriptions of 7,785 species, varieties, and forms of plants; articles on special groups of plants, such as roses, lilies, daylilies, dahlias, chrysanthemums, narcissi, orchids, etc., written by recognized experts; directions for growing vegetables, shrubs, trees, vines, etc., and for making rock gardens, aquatic, cactus, fern, Japanese and penthouse gardens, coldframes, hotbeds, conservatories; for contending with diseases, insect pests,—

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* The Garden Dictionary. 896 pages, with numerous text-figures and several plates, colored and uncolored. Houghton-Mifflin Company, Boston and New York. 1936. Sold by subscription, $16.25.

in fact, the book contains virtually everything that a modern gardener needs to know.

The publishers have been remarkably successful in reproducing the actual color of flowers in their colored plates, as in those of the lilies, roses, and chrysanthemums.

The indicated pronunciations of Latin names, based, in critical cases, on the results of a referendum among scholars and botanists qualified to hold an opinion, add to the value of this new book, as do the definitions of all the more common botanical and horticultural terms.

Although The Garden Dictionary enters a field that has been considered by some to be already well covered, its practical up-to-date treatment of the whole range of horticultural subjects in one volume will commend it highly to the rapidly increasing number of people in the United States and Canada who are actively interested in the growing of plants. The editor, Mr. Norman Taylor, and its publishers, the Houghton-Mifflin Company, are to be congratulated upon their initiative and success in bringing out one of the handsomest and most worth-while books in the field of horticulture.

MARSHALL A. HOWE.

LOCAL FERNS AND FAR GLIMPSES

The purpose of this book,* "to facilitate the study and determination of the ferns of the Local Flora Area," is fulfilled by the attractiveness as well as by the completeness of presentation. The brevity of the glossary indicates with what slight recourse to technical terms the labor has been accomplished. Written out of a rich background of knowledge, the book is invaluable for reference and delightful for many vistas into unexplored fields.

The flora area designated, covering a radius of 100 miles outside of Manhattan, abounds in fern plants, and remains, to a surprising extent, botanically unexplored. If any publication can stimulate further activity, this book will do that; fern students are not likely to confine their interest to a single area, and there is sufficient new information, data, and original inquiry here to start the student upon a re-examination of all his previous determinations. Ninety species of true ferns and fern allies are described and excellently illustrated. No detail has been accepted without verification, leading to frequent divergence from statements in popular manuals. To cite an example, in the discussion of the difficult and confusing species of *Dryopteris, D. intermedia, D. spinulosa,* and *D. campyloptera* Clarkson, at least eight essential points of difference among the three are

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* Small, John Kunkel, Ferns of the vicinity of New York. 285 pages, 85 line cuts and map. The Science Press, Lancaster, Pa., 1935. $2.50.

demonstrated. Throughout the book, four unusual points of identification, among others, are specified: the form, as well as the habit, of the rootstock; the vernation and completeness of the crown (where present); the pattern and angular direction of the leaflets and segments; and the exact position of the sori on the veins (the last-named also clearly indicated in the drawings). In other instances where determination is doubtful, as in *Lycopodium flabelliforme* Fernald vs. *L. tristachyum,* the differences are carefully stressed in the comment following the botanical description

This work is not intended for beginners; and yet the drawings alone would serve as a fairly safe guide. They are sensitive to the least variations in the cutting of leaflet, segment and toothing, and though the leaf-silhouette may be a dangerous criterion in itself, it is one which many students have had to ignore because of crude or faulty illustrations. Ferns which vary notoriously, like *Cystopteris fragilis,* might better have been illustrated by two or three drawings: the form portrayed in this book has sharply toothed, spreading segments, whereas an equally common form in our region has segments often obovate, even wedge-shaped in small specimens, and more decurrent on the midrib. It is this form, too, which is sometimes confused with *Woodsia obtusa.* Two details of the drawings appear to be at variance with the text: the segment (pinnule) of *Dryopteris intermedia* shows sori terminal on the veins, the segment of *D. spinulosa* shows sori not quite terminal.

In the matter of taxonomy Dr. Small retains, for the most part, the established classifications, a conspicuous exception being in the segregation of *Diplazium angustifolium* Butters as *Homalosorus pycnocarpus.* Reasons for the change are fully stated and acceptable, if not finally convincing. *Phegopteris* and *Thelypteris,* it is good to see, have been retained, contrary to some modern tendencies, though here again *Phegopteris* is placed in the group Dryopterideae, whereas, based on sorus and indusium, *Phegopteris* belongs more properly with the Polypodieae. But this is an old debate, and the effect of Dr. Small's distinctions is to promote a liberal and realistic viewpoint.

D. T. WALDEN.

ILLUSTRATED FLORA OF HAWAII

With the assembling of the second volume of the Flora Hawaiiensis,* the general plan and destiny of this tremendous undertaking is becoming clear. It is a looseleaf flora, each sheet being devoted to one species, with an excellent detailed drawing of the plant and its structure on the reverse side. Additional sheets are

* Degener, Otto, Flora Hawaiiensis, Vol. 2, published by the author, 2220 University Avenue, Honolulu, Hawaiian Islands, 1936. $4 a volume.

inserted where required, for family and genus descriptions and analytical keys. The descriptions are very full, and are supplemented by economic and geographical notes that make the subject matter as valuable to the layman as the botanist.

Each volume consists of one hundred species descriptions, making the first two volumes only a beginning toward a complete Hawaiian flora. Many of the plants treated are pantropic in distribution, and as many more are endemics of these isolated islands. The desire to preserve a record of the fast disappearing native flora has evidently served as a motive for this work—and a worthy one deserving of our best wishes and support. Mr. Degener carries on this project in close coöperation with The New York Botanical Garden.

There is no regular order in which the groups of plants are studied and figured, and the first two volumes give samples of most of the great families of the vascular plants, from ferns to composites. Since the new sheets as they appear will be inserted as interleaves in the looseleaf binders, no page numbers are given. Instead there is a family key number, from 1 to 344, and a generic and specific name which serve as guides to the assembly of the pages. Genera and species are to be arranged alphabetically.

This strictly logical but unconventional looseleaf treatment, coupled with the issue of each sheet separately, with its own publication date, makes this the despair of the bibliographer, since it can be cited by neither page nor volume. The pages that were issued in the first volume (first century) are now distributed through two. As each new century is completed, they will be again reassembled and spread through more volumes. So how shall a new species, described on one of these separate sheets, be cited in the literature?

Even in its present preliminary form, the Flora is an excellent guide for travelers in Hawaii, and a useful reference for anyone interested in tropical crops and plants. *Billbergia, Cordyline* (*Sansevieria* in common usage), *Belamcanda, Hedychium, Spathoglottis, Artocarpus* (jack-fruit) *Macadamia, Stylurus* (*Grevillea*), *Artistolochia* and *Antigonon* are among the many world-wide forms which are treated. Mr. Degener has the propensity—not peculiarly his—of digging up new or unfamiliar names for old familiar plants—but he is kind to us in giving us full synonymy. No student of tropical plant life, whether botanist, gardener, planter or globe-trotter, should be without this Flora, which combines scientific treatment and popular utility.

FORMAN T. MCLEAN.

SMALL VOLUMES INTENDED FOR BEGINNERS

The book market is besieged month after month with new volumes on gardening. How to raise this kind of plant, how to con-

struct a garden of this or that sort, what to do in the north, in the south, in the greenhouse, or in the bay-window are told in small books of one or two hundred pages, scarcely deserving the name of volume. The bulk of these have been coming of late from Doubleday Doran.

Some of them seem to have fairly adequate information for beginning gardeners; others give only the semblance of the story they ought to tell. As a whole, they are coarsely printed and illustrated with drawings in which a hair-line is given the thickness of a rope.

Delphinium Culture

Take, for instance, Dr. Leonian's book on delphinium culture.[1] There is no question but that the author knows his subject thoroughly, and he no doubt answers many problems for the amateur grower; yet the beginner who wants to grow delphiniums finds, first, 26 pages describing these flowers, to the accompaniment of highly inaccurate drawings; then the advice to add peat-moss to the soil if it is either too sandy or too heavy—despite the fact that delphiniums prefer a limy mixture, and peat-moss has an acid content. Eventually, directions are given for sowing seeds; but one never finds out just when to expect the flowers from seeds sown at different times of the year.

Plants under Cover

The same publisher's new books on house plants and on gardening in a greenhouse are both extremely personalized reports, telling what one individual has done rather than what many others might do with growing plants under cover. Mrs. Sulzer's sentimental volume[2] contains, nevertheless, quite a bit of practical information, provided one does not take too seriously such stories as that about *Ficus pandurata* (which should be called *F. lyrata*) supposedly being the fig-tree of the "weak-willed Eve." But the drawings only now and then resemble the subject treated.

For the novice who gloats over other novice's trials, Anne Dorrance's book[3] will provide an evening's amusement and perhaps some practical help; but as in the delphinium book, too much space is given to descriptions which seem to get the reader no-

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[1] Leonian, Leon H., How to Grow Delphiniums. 96 pages, illustrated. Doubleday-Doran, Garden City, N. Y., 1935. $1.

[2] Sulzer, Marjorie Norrell, House Plants, Modern Care and Culture. 156 pages, illustrated. Doubleday-Doran, Garden City, N. Y., 1935. $1.50.

[3] Dorrance, Anne, Gardening in the Greenhouse. 129 pages, illustrated. Doubleday-Doran, 1935. $1.50.

where. The chapter relating the author's experiences with 36 plant subjects gives some ideas as to how these few plants may or should not be handled.

Pointers for Plants Outdoors

Four new books of pamphlet size have been written by Victor H. Ries,[4] one on the proper handling of trees and shrubs, one each on annuals and perennials, and one on pests and diseases. A gardener may not agree with all of the author's ideas for combining annuals, but the general directions he gives, both in this book and in the one on perennials, show that he knows the type of questions amateur gardeners ask year after year. One hopes, however, that many will not search for "Acrolinum" in catalog lists of everlastings at his recommendation; especially since *Acroclinium* (although few seedsmen know or heed the change) was long ago shifted to the genus *Helipterum*.

What to do about pests and diseases on 100 kinds of plants, including the commonly planted trees, shrubs, and garden flowers, is told in the last half of Ries's book, "Plant Welfare." "Know your pests" and "Know your diseases" he advises in two of the preceding chapters . . . but one scarcely could get acquainted with either through his brief, loose descriptions. The directions for treatment are clear enough so far as they go, but there is not enough detail as to symptoms to determine a plant's real ailment in every case. He is an optimist who thinks that only aphis infest chrysanthemums, who omits (perhaps wisely!) any mention of mosaic disease on lilies, and who neglects hawthorn altogether, as though it were always disease-free. Nevertheless, the amateur gardener will at least get a start toward keeping his garden healthy through this book, especially as to the proper mixing of sprays and dusts.

The information given in "Pruning and Repairing of Trees, Shrubs and Ornamentals" is hardly dependable enough to be well recommended. The book is intended for amateurs, and they above all need faultless directions for the care of their plants. The section on pruning for shape is not clearly expressed, and may easily lead to wrong practices. Moreover, it is not considered good gardening to prune a plant that is too large for its situation. Replacing is the only remedy here. The author rather overemphasizes

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[4] Ries, Victor H., How to Grow Annual Flowers, 96 pages, illustrated, $1; How to Grow Perennial Flowers, 94 pages, illustrated, $1.; Plant Welfare: Recognition and Control of Pests and Diseases, 96 pages, illustrated, $1; Pruning and Repairing of Trees, Shrubs, and Ornamentals, 95 pages, illustrated, $1. Doubleday-Doran, Garden City, N. Y., 1936.

fertilization, forgetting that often shrubs do not bloom because they are planted in too rich a soil and neglecting the importance of a properly prepared planting hole, in the right locality and with the right exposure.

A Misfortune in Ferns

It has taken a long time to decide what to say about "American Ferns",[5] a Macmillan publication. At least four different people—all, apparently, with kindly hearts—refused to review the book because of its many inaccuracies. One critic pointed out errors noted in the habitats of ferns, such as accrediting the bog-loving *Aspidium cristatum* to an oak association; another in the ideas of where certain ferns belonged in the garden, such as the placing together of a lime-loving and an acid-loving species. A tabulated list of faults that have been found in this unfortunate work would occupy the space of a chapter.

The title itself is somewhat of a misnomer, as the book concerns mainly the ferns of northeastern United States, omitting those of mid western, western, and southern distribution.

Is there any reason for a presumably reliable publisher letting so many errors get into print? The public is in no position to recognize such mistakes, and some innocent but enthusiastic gardener may make a complete failure of an attempt to identify, gather, and raise ferns by trying to follow this book. There are plenty of experts who would have been glad to correct these mistakes in the manuscript, instead of having to find them in print to talk about afterward.

Carol H. Woodward.

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[5] Roberts, Edith A., and Lawrence, Julia R., American Ferns and How to Grow Them, 98 pages, illustrated with photographs. Macmillan, New York, 1935. $2.50.

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Four hundred acres of beautifully diversified land in the northern part of the City of New York, through which flows the Bronx River. A native hemlock forest is one of the features of the tract.

Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

Gardens, including a new rock garden, a large rose garden, a perennial border, small model gardens, and other types of plantings.

Greenhouses, containing thousands of interesting plants from America and foreign countries.

Flower shows throughout the year—in the spring, summer, and autumn displays of daffodils, lilacs, irises, peonies, roses, water-lilies, dahlias, and chrysanthemums; in the winter, displays of greenhouse-blooming plants.

A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants; also historic microscopes.

An herbarium, comprising more than 1,800,000 specimens of American and foreign species.

Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

Scientific research in laboratories and in the field into the diversified problems of plant life.

A library of botanical and horticultural literature, comprising nearly 45,000 books and numerous pamphlets.

Public lectures on a great variety of botanical and horticultural topics, continuing throughout the autumn, winter and spring.

Publications on botanical subjects, partly of technical, scientific, and partly of popular, interest.

The education of school children and the public through the above features and the giving of free information on botanical, horticultural and forestral subjects.

The Garden is dependent upon an annual appropriation by the City of New York, private benefactions, and membership fees. Applications for membership are always welcome. The classes of membership are:

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JOURNAL
OF
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A. B. STOUT

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ON PREPARING AN EXHIBIT OF THE LIFE CYCLE OF THE MYCETOZOA
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JOURNAL
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LILIES FOR GARDENS[1]

Surely, at least some of the true lilies are known and desired by every gardener. As a rule the lilies have large conspicuous flowers of firm texture, lasting quality, attractive form and delicate beauty. Also there is usually attractive foliage previous to flowering. These qualities give distinction to any group of plants and it is not surprising that lilies have been grown and highly prized since the earliest dates of flower gardening.

Few groups of plants have received as much attention in horticultural literature as has the genus *Lilium*. Much has been written regarding the description, the behavior, and the cultural needs of the different lilies. Several volumes exclusively devoted to lilies have appeared both in Europe and America. Hence we may ask, what is there that the gardener now needs in the way of information regarding lilies?

Let us answer this question by considering the status of lily culture. In the average flower garden one rarely finds more than a few lilies and often there is none. Gardeners report that lilies are difficult to grow; that bulbs obtained for planting often grow poorly; and that plants which have thrived for several years are liable to become stunted and to die. In most gardens, lilies have an erratic and ephemeral existence that is indeed discouraging.

This situation was fully recognized some ten years ago and a project of study and experimentation was begun to determine not only the reasons for the general failure in lily culture but the practical measures necessary to insure the more successful culture of this group of valuable garden plants. A fellowship investigation was established in 1927 and this has continued to date

[1] From a radio talk given over Station WOR on May 8, 1936, as a part of The New York Botanical Garden's contribution to the programs of the Radio Garden Club, under the general direction of the Extension Service of the New Jersey State College of Agriculture, Rutgers University.

under the coöperation of Cornell University, The Boyce Thompson Institute for Plant Research and The New York Botanical Garden. For a time The Horticultural Society of New York also gave support to the project. The results of these studies have contributed much new information regarding the reasons why lilies fail in garden culture.

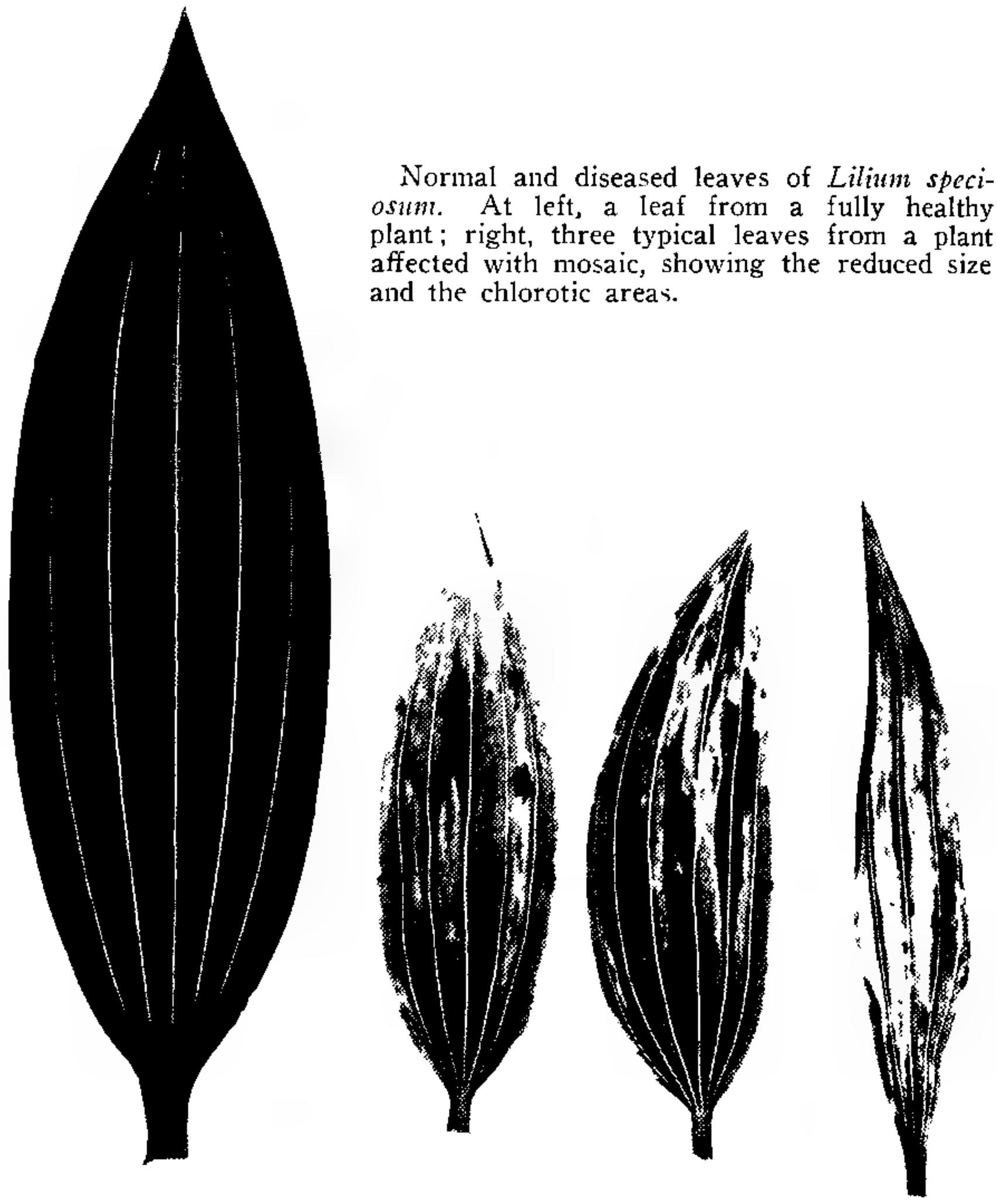
There are more than 100 different species or wild types of lilies and there are several clones of hybrid origin. About half of these have been grown as garden subjects in the United States. Some of these are delicate in constitution and others require special care and treatment. As a rule these lilies enjoy good drainage, a fairly rich soil, and exposure to sunlight or only partial shade. A thin mulch of salt hay, straw, or even leaves will prevent severe and repeated freezing and thawing of the soil and of the bulbs during open winters. A top dressing of rich soil or fully decayed compost each spring is to be advised. When the plants of a group multiply until there is obvious crowding, some thinning is in order. To provide these essential cultural conditions only simple common-sense operations within the scope of almost any gardener are required. At least fifteen of the best lilies are fully hardy and adapted to easy culture in any ordinary flower garden in the region about New York. It is the repeated failure of these hardy and more vigorous garden lilies that is the chief concern to gardeners at this time. It is evident that these repeated failures are not due merely to poor or unsuitable culture.

Most gardeners will purchase commercial bulbs of lilies for planting and hence the first matter of concern is the physical condition of the bulbs obtained. Often the bulbs which come to the gardener are more or less dried out, bruised and broken, infected with fungi which cause rots, or infested with bulb mites. Such bulbs may not even grow; they may produce a weak stem but fail to develop a daughter bulb, in which case the plant disappears. The improvement in methods of handling, shipping, and storing bulbs and the treatment to prevent rots and mites are responsibilities of the bulb growers and dealers. Certain of these parties have during the past few years coöperated in the scholarship studies already mentioned and it now appears that measures have been developed for use at the source of supply which will greatly reduce both the soft and the dry rots which are very destructive to bulbs.

The gardener can do his part in this matter by purchasing bulbs in case lots for direct delivery and by planting the bulbs as soon as they are received. The best time to plant commercial bulbs is in autumn as soon as it is possible to obtain them.

The mites that infect lily bulbs are widely distributed in America, in Europe and in the Orient. Commercial bulbs are often infested with mites and they spread from bulb to bulb during storage. In the garden, infested bulbs are usually destroyed sooner or later and mites migrate to healthy bulbs. Various treatments of the bulbs to destroy mites are being tested. When mites are present in a lily planting, crop rotation is about the only recourse.

The main cause of many and repeated failures to maintain lilies in gardens after they have once been established is a virus disease known as lily mosaic. This disease is widely spread in the areas of commercial bulb production; it is certain to come to any garden sooner or later in some of the bulbs that are purchased; it is nearly always to be found in a garden in which lilies are being grown. The virus is spread from diseased plants to healthy ones by the melon aphis which is nearly always present. Many of the most desirable lilies, such as *Lilium speciosum* and *Lilium auratum*, succumb quickly to this disease. The result of infection at the time when blooming is about to begin is striking. The flower buds and the upper part of the stems blacken and die, the leaves fall and only a bare dead stem remains. If the plant survives until the next year the growth is poor and the leaves are noticeably mottled. In some of the narrow-leaved lilies, as *Lilium tigrinum*, diseased plants may live and bloom well for years; but such plants are a menace for they are a source of infection for other lilies which succumb more quickly. It seems certain that plants which possess mosaic never recover and that the virus spreads to all parts of a plant, including the bulb. Hence the gardener should destroy completely every lily which shows symptoms of mosaic, and this roguing should begin early in spring. The chlorotic blotches are readily noted in the broad-leaved lilies but less easily detected in narrow-leaved types like *Lilium tigrinum* and *Lilium regale*. In time, no doubt certain commercial producers will be able to provide bulbs free of mosaic, for efforts in this direction are being made. But at present it is necessary that the individual gardener exercise diligent inspection and eliminate



Normal and diseased leaves of *Lilium speciosum*. At left, a leaf from a fully healthy plant; right, three typical leaves from a plant affected with mosaic, showing the reduced size and the chlorotic areas.

any and all plants which are diseased or which may become diseased.

Of the several fungous diseases that affect lilies the most serious is the fungus called *Botrytis*. The effects of this parasite have been recognized for more than 50 years and its severe injury to such lilies as the Madonna and *Lilium testaceum* has long been dreaded by gardeners. The symptoms are the appearance of mouldy and decaying blotches on the leaves and in severe attacks the leaves, flowers and stem become dead and brown almost as though seared by fire. The Botrytis fungus is spread by conidial spores especially during warm moist weather. To combat this

disease, plant lilies, and especially those most susceptible, in the higher, drier and more sunny locations. In the spring remove the old basal leaves on the stems of the Madonna lily together with all refuse about the plants. To protect new growth apply Bordeaux spray (4-2-50). During periods of wet weather a thorough application once a week may be necessary. The mosaic disease and the Botrytis mold are the two major causes of failure with lilies after they have once been established in a garden. With control of these the average gardener will have little difficulty in growing at least 15 of the best lilies.

The 15 to 25 best garden lilies provide considerable diversity in color and shape of flower, in stature and habit of growth and in season of flowering. For red with dark spots and recurving flowers there are *Lilium amabile, L. Davidi, L. warleyense* and *L. tigrinum.* Of those with bright scarlet and few or no spots there are *L. tenuifolium* and *L. chalcedonicum.* Other excellent lilies with nodding blooms of various colors are the native *L. canadense* and *L. superbum; L. pardalinum* from the Pacific Coast; *L. Martagon* of Europe; *L. Hansoni, L. Henryi* and *L. speciosum.* Of large-flowered semi-nodding types there are *L. regale, L. Brownii* and several types of the giant-flowered *Lilium auratum.* The last-named lily is highly susceptible to the mosaic disease and will quickly succumb to its attack, but otherwise it is an easy lily to grow. No collection of lilies is adequate without the Madonna and the Nankeen lilies. Of lilies with upright flowers there are *L. croceum, L. dauricum, L. concolor,* and various hybrids and types known as *L. elegans.* All these and others are fully suitable for the average gardener. A goodly number of less easily grown lilies of rare charm and beauty may be grown by those who desire more kinds of lilies.

The raising of lilies from seed is now becoming somewhat general among lily enthusiasts. The procedure is not difficult but usually it requires several years to bring seedlings to flowering age.

In closing let me assure you that the outlook for success in growing lilies is now most encouraging. The gardener may now understand the main causes for failure with these plants and be informed regarding the measures necessary for success.

A. B. Stout.

TWENTY-FOUR CHOICE ORNAMENTAL SHRUBS

The New York Botanical Garden is frequently asked to recommend choice ornamental shrubs. The following list, which enumerates the twenty-four favorites of the writer, may be helpful to those who are bewildered by the great number of varieties which are offered in nursery catalogues. Any limited selection oi this type will, of course, always be influenced by the personal taste of the one who makes it; that is unavoidable. Nor does this list mean to present a final judgment.

On the other hand, all desirable qualities of the shrubs, such as abundance of flower production, good habit of growth, ornamental effect of the foliage, and ease of culture have been carefully considered in making the choice, so that no one will be disappointed who grants any of these shrubs a place in his garden.

Lilacs, roses, and rhododendrons (except for one) have not been included in this selection. In each of these large and variable genera there are so many excellent forms that it is quite impossible to limit the choice to one or two. To include all the varieties that are worth having would swell this list to several times its present length.

* * *

1. *Amelanchier grandiflora* and its variety *rubescens.* This handsome shadbush is a hybrid between *A. canadensis* and *A. laevis,* combining all the good qualities of both parents besides having larger flowers than either. The variety *rubescens* has soft pink flowers and is, according to my opinion, the finest of the whole genus. It has to be propagated by grafting and grows into a tall shrub. As yet, however, this shadbush is not available in the trade and is rare even in collections.

2. *Buddleia alternifolia.* A native of the Tibetan borderlands, this butterfly-bush is one of the few species of the genus which has alternate instead of opposite leaves. Its densely clustered lilac flowers appear in June on the growth of the previous season and cover the slender, sweeping branches to a length of several feet. It is perfectly hardy, even north of New York City, and delights in a well-drained, stony, clay soil and full sun.

3. *Corylopsis pauciflora.* This graceful little shrub, which rarely grows more than four feet high, is a member of the Witch-hazel Family and endears itself by its primrose-yellow, bell-shaped flowers which appear before the leaves toward the end of March or in early April. Its foliage also is exceedingly handsome and decorative. A good woodland soil and partial shade suit it to

FIGURE 1. The sweeping branches of *Buddleia alternifolia* are covered with lilac-colored flowers in June. This butterfly-bush is entirely hardy in the north.

perfection. For the southeastern states the much taller *C. Willmottiae* can also be recommended, but *C. pauciflora* remains my favorite.

4. *Crataegus oxyacantha* var. *Masckii*. The rather offensively brilliant *Crataegus oxyacantha* var. *Paulii*, known as "Paul's double scarlet hawthorn," is not to my taste and I would never include it in a selection of choice ornamental shrubs. The var. *Masckii*, on the other hand, which belongs to the same species, has double flowers of a very pleasing clear pink color and deserves to be numbered among the select. As yet this variety is not in the trade.

5. *Cotoneaster rosea*. Of the large genus *Cotoneaster*, renowned for its many beautiful species, this is one of the choicest members and my particular favorite. It is the only species with

pink flowers which spread their petals so that they become conspicuous and ornamental. In June when in full flower this shrub is very handsome and it delights us again in September when covered with the brilliant red berries. Although a native of the Himalayas this species is not safely hardy further north than New York City. Like all Cotoneasters, it prefers a well-drained stony, clay soil and needs full sun.

6. *Daphne Genkwa.* This Chinese species of *Daphne,* undoubtedly the most beautiful of the genus, is still very rare in cultivation but, if given some protection, it is hardy as far north as New York City. Its clear lilac-colored flowers are produced in April, before the leaves appear, and the shrub then presents a striking resemblance to a small lilac-bush. It does not reach more than two or three feet in height. Its propagation is readily effected from green cuttings, which have to be taken while they are still very soft.

7. *Enkianthus campanulatus.* The "necklace-bush" with pendent, bell-shaped flowers, which look as if they had been carved from red-veined jade, is particularly valuable because it flowers satisfactorily in shade as well as in sun. Its azalea-like leaves assume brilliant colors in the autumn. Any good garden soil, as long as it does not contain lime, satisfies this shrub, but it must not be permitted to suffer from drought. For the southern states the more tender species, *Enkianthus deflexus,* with much larger and showier flowers, can be recommended still more highly.

8. *Forsythia intermedia* var. *spectabilis.* This is the showiest, the most floriferous, and the most dependable of all the varieties of "golden-bell."

9. *Gordonia altamaha.* Although a native of Georgia, this shrub is hardy even north of New York City. It is particularly valuable for its flowers, which are large, white, and fragrant and appear from September until October, well displayed on the ends of the branches. Its large, handsome leaves color scarlet in the autumn. Moist woodland soil with good drainage underneath fills its wants.

10. *Halesia monticola* var. *rosea.* In my opinion this is the loveliest of the "silver-bells," having large, pink-flushed flowers which appear in June in great profusion. If given a chance it will develop into a small tree. It is not fastidious as to soil but must have full sun. As yet it is not in the trade.

11. *Hamamelis mollis.* This is the largest-flowered and handsomest of the witch-hazels. Its grayish, velvety leaves also are more ornamental than those of the other species. Unfortunately, it hybridizes readily with *H. japonica,* so that seeds are unreliable as a means of propagation unless they are imported from China. The hybrids are always inferior in beauty.

12. *Kolkwitzia amabilis.* The "beauty-bush" has been much slandered as a shy bloomer but this charge holds true only if it is planted in too rich soil or in the shade. It demands full sun, free air circulation and a well-drained, gravelly, clay soil. Under such conditions it is unsurpassed in grace and loveliness. Seedlings sometimes take as long as ten years before they commence flowering. Cuttings usually start flowering when they are five years old.

13. *Lespedeza formosa.* This shrub, also known as *Desmodium penduliflorum,* is indispensable because of its late, very showy, purple flowers which appear in September and October and are produced in great profusion. It is much superior to the smaller and earlier-flowering *L. bicolor.* Any poorish, stony soil in full sun suits this shrub.

14. *Magnolia stellata* var. *rosea.* Of all the beautiful varieties of this famous genus, the shrubby *M. stellata* with its early,

FIGURE 2. The pink-flushed flowers appearing in June on *Halesia monticola* var. *rosea* (left) make this variety of the silver-bell especially desirable. Also pink-flowered in early summer is *Cotoneaster rosea* (right), which in September is covered with brilliant red berries.

star-shaped flowers is my special favorite. The still rare variety *rosea* with pink-flushed petals is even more desirable than the species.

15. *Malus purpurea* var. *Elevi.* The large, dark-pink flowers, the purplish foliage, and in the fall the abundantly produced bright-red apples the size of plums recommend this crab-apple above all others. It is of hybrid origin, and three species—*M. pumila Niedzwetzkyana, M. Halliana* and *M. Sieboldii* –have contributed to its exceptional beauty.

16. *Philadelphus virginalis* "Virginal." There are more than 100 species, varieties and hybrids in this beautiful genus but none surpasses "Virginal," which is now quite generally available in the trade. Its large, semi-double flowers, which are white and sweetly fragrant, are produced in the greatest profusion and over an unusually long period. Sharp pruning immediately after flowering is advisable.

17. *Potentilla fruticosa* var. *parvifolia.* This dwarf variety of the shrubby cinquefoil does not reach more than two or three feet in height. It is a native of northeastern Asia and is remarkable for the great abundance of its golden-yellow flowers, which are produced from the end of May until September. An excellent companion for this showy little shrub is the horned violet "Jersey Gem."

18. *Rhododendron dahuricum var. mucronulatum.* If this member of the section Azalea has been singled out for mention in this list, it is not meant to suggest that it is the best of the genus. There are many others equally beautiful. But it is unique among the truly hardy rhododendrons in producing its showy rosy-purple flowers in March and April, at a time when flowering shrubs are most appreciated.

19. *Spiraea Watsoniana.* The large genus *Spiraea* contains many beautiful species and hybrids of undisputed garden merit. The hybrid *S. Watsoniana* is singled out here as probably the most desirable of the summer-flowering spiraeas. It produces its bright rosy-purple flowers during July and August when flowering shrubs are scarce. The white *Spiraea albiflora* flowers at the same time and offers a pleasing combination.

20. *Stewartia pentagyna* var. *grandiflora.* The species *S. pentagyna* is native to the southeastern states and is offered by several nurseries. The variety *grandiflora*, which frequently is not recognized and which occurs wild together with the species, deserves our special favor. Its flowers are not appreciably larger, but the filaments which bear the orange anthers and which are white in the species, are bright purple in the variety, enhancing the white beauty of the flower. Its flowering time is July, which increases the garden value of this tall shrub. The handsome, large leaves color beautifully in the autumn.

FIGURE 3. The variety Katherine of the common blueberry, *Vaccinium corymbosum*, offers waxy white flowers in spring, luscious berries in midsummer, and brilliantly colored foliage in the fall.

21. *Styrax japonica.* This tall, graceful shrub produces an abundance of white, bell-shaped, slender-stalked flowers late in June. Well-drained, stony, clay soil and full sun suit it best, but it has to be guarded against drought.

22. *Symplocos paniculata.* The "sapphireberry" is one of the few shrubs which provides two seasons of ornamental display. In June this tall shrub, which may reach thirty feet in height and almost as much in diameter of spread, is nearly smothered with its showy white flowers. In September its abundantly produced

bright sapphire-blue berries startle the beholder with their rare and beautiful color. This shrub also is best accommodated in well-drained, stony, clay soil and full sun.

23. *Viburnum Carlesii.* This handsome shrub with its salmon-pink buds and white, sweetly fragrant flowers has become quickly and firmly established in the affection of the gardening public. It flowers toward the end of April or in early May and is partial to full sun, free air circulation and a deep, well-drained soil. Do not permit it to suffer from drought. *V. Carlesii* should be propagated from seeds.

24. *Vaccinium corymbosum* "Katherine." It may seem strange to suggest the American highbush blueberry as one of the choicest ornamental shrubs, but the new large-fruited forms, especially the variety "Katherine," are desirable not only for their ample crops of luscious berries. The abundantly produced clear-white, honey-fragrant flowers and the shiny, dark-green foliage, which colors brilliant scarlet in the autumn, render this shrub so beautiful that it can vie with the best of the ornamentals. The delicious fruits are its crowning achievement. For the owner of a small garden there is no other shrub in the whole world which has to offer so many desirable qualities.

HENRY TEUSCHER.

ON PREPARING AN EXHIBIT OF THE LIFE CYCLE OF THE MYCETOZOA

At the annual exhibition of the New York Microscopical Society, held at the American Museum of Natural History in the City of New York, on February 15, 1936, the writer exhibited the life cycle of the Mycetozoa from spore germination, through the plasmodium, to the mature fruiting bodies. A large attendance was expected and was present; yet no difficulty was experienced in exhibiting the living material. However, it did require early preparation and careful attention, so that it would be in perfect condition on the night of the exhibition; and precautions were taken against the cold weather while in transit from the laboratory, where the material was developed, to the Museum building about 20 miles away. The methods used in preparing the living material were simple enough, but it must be said that the person who attempts to make such an exhibit must be somewhat familiar with the group and with the habits of the organisms, and also in a position to obtain the necessary fresh field material.

Experiments were first conducted with the spores of a number of species collected during the season of 1935, in order to determine which were most suitable for the purposes of a public exhibition, and also to fix the time for the cultures to be started in advance of the exhibition. The spores were placed in small corked vials, with about two drams of rain water that had been standing in a bottle for a long time and that was known to contain bacteria, but no protozoa. Enough spores were used so that a drop of the culture, when placed under the microscope, would show a hundred or more spores in the field at one time. The vials were shaken occasionally, to break up the thin layer of air that surrounds the spores, which prevents access of the water and probably accounts for the fact that many spores in the same culture required longer time to germinate than others. It was found that three species, *Stemonitis splendens*, *Didymium squamulosum*, and *Badhamia orbiculata*, were suitable, the spores of each germinating, in considerable number, within 24 hours. The cultures of *S. splendens* were free from protozoa, but with the two others the protozoa developed and were in such numbers after 72 hours that they were disastrous to the cultures after that time. It was concluded then that 24, 48, and 72 hours before use would be proper periods at which to set out the spores in water, so that all stages from the emerging swarm-cells to the young plasmodia could be obtained. Another set of cultures was made to confirm the results and conclusions, and all that was necessary then was to prepare a number of vials of each species at the periods mentioned prior to the evening of the exhibition. It is better to prepare a number of vials of each species, rather than to risk failure, through unforeseen contingencies, with a single vial.

For the public exhibition under microscopes, slides with a concave center and cover glasses with a ring of vaseline to retard evaporation were used. A magnification of about 200 was employed, with an objective of sufficient working distance and a high eyepiece. The younger cultures were used to show the ruptured spores, with the hyaline, immobile swarm-cells near by, and the older ones for the flagellate swarm-cells with their dancing, wriggling motion. Intermediate and later stages were often present in the field of view, but obviously, it was not practicable to demonstrate these to moving spectators as it would have required too much time and attention. Under such circumstances, it is

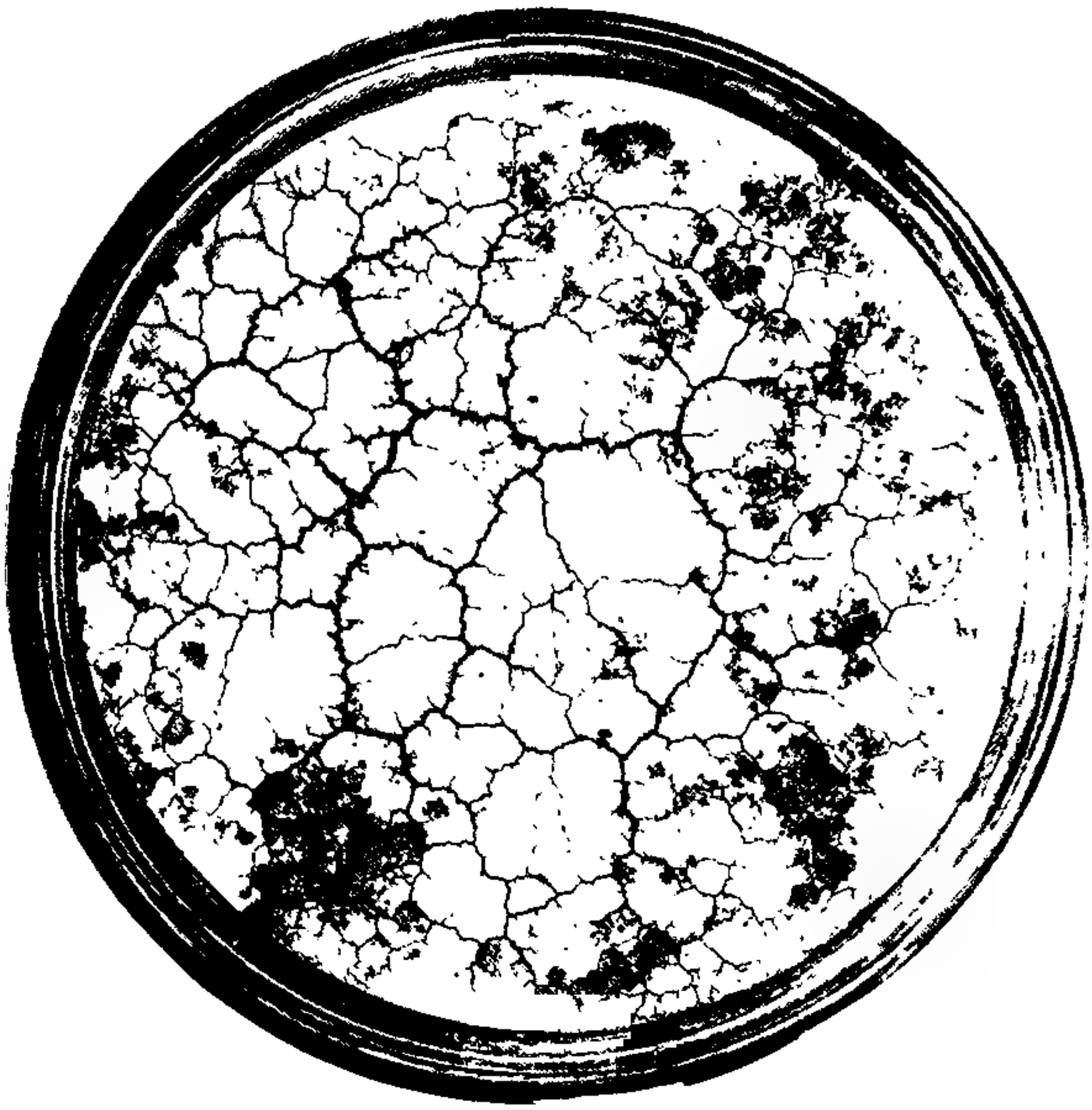
possible to show only stages in which a large number of individuals are present in the field at one time, and explaining these by appropriate cards placed near the microscopes.

The display of about 15 active, living plasmodia was of keen interest to the people, many of whom had never seen one. They were displayed on filter paper in petri dishes, culture dishes, and similar low glass vessels, ranging in size from three to seven inches. The larger vessels showed to better advantage the behavior of the plasmodium as a whole, with the solid, netted advance enclosing food in its travel; the veining and ribbing behind the advance; and, in the older plasmodia, the growth upwards, the lateral spread being restricted by the confines of the vessel. Some of the smaller plasmodia had been raised on semicircular paper, so that part would spread over the glass bottom, and these were used to demonstrate, under microscopes, the rhythmic streaming of the protoplasm, and the absorption of food by the gradual closing of the netted part of the plasmodium in which many small protozoa were trapped. Others were handed around to be examined with hand magnifiers. Two plasmodia of the same species were placed close to each other, and fused during the exhibition within 15 minutes of the time expected. Two others, a green one and a yellow one of different species, were similarly placed. They joined, but it was not until the next day that the yellow one had disappeared, probably devoured by the green one.

The plasmodia were developed from three lots of sclerotium (the resting stage assumed under conditions of drought) collected on bits of old wood in November of the preceding year. Two of the species were determined later as *Arcyria denudata* and *Stemonitis Smithii*, as in each case a few sporangia were produced when the sclerotia were revived with moisture. A number of plasmodia of each of these species were raised, but all were weak and small, not more than an inch or so across, and unsuitable for demonstration. The other sclerotium produced many large, vigorous, yellow plasmodia, that were very active in their movement and growth, but none of them developed fruit when placed on paper, although food was withdrawn. More than three months after this sclerotium had been revived, there appeared on the wood in the jar later referred to, about 30 sporangia of *Trichia persimilis* in two small clusters. There is no reason to doubt that they were the fruit of the yellow plasmodium, parts of which had

been repeatedly taken from the jar. The food had been stopped a month or so before the sporangia appeared. All plasmodia were kept vegetating for about 10 weeks, after which they were permitted to go into sclerotia again by drying. A few had been dried in the meantime and revived by wetting. The plasmodia of *Trichia persimilis,* of which about 20 were raised, provided the principal material for the exhibition.

Experiments in raising the plasmodium were commenced a full month before the date required, so as to provide time for possible changes in the technique used. The small petri dishes were lined on the bottom with four layers of filter paper, which was thor-



One of the seven-inch plasmodia of slime-molds (Mycetozoa) shown at the recent exhibit of the New York Microscopical Society. Food was absorbed by this living gelatinous mass as it traveled and grew across the glass vessel on which it was exhibited. Spectators were permitted to watch the characteristic flowing motion of other plasmodia under the microscope.

oughly wetted with ordinary tap water known to be free from chlorinating agents. A small piece of sclerotium, not much larger than a pin head, was laid upon the paper in each dish. The plasmodia revived in four or five days and, in the case of *Trichia persimilis*, they filled the dishes in about a week after revival. As all were somewhat dirty from parts of the sclerotium that did not revive, and also from small fragments of wood attached to the sclerotium, a different method was devised for raising the larger plasmodia. At the beginning of the experiments, the wood containing sclerotium of *Trichia persimilis* had been broken into small pieces, except one piece about four inches in length. The small pieces had been placed as a layer, about one inch deep, on the bottom of a two-quart jar, with cover, and the larger piece was placed diagonally from the layer to the top of the jar. The wood was wetted thoroughly and the surplus water drained. The cover was left off occasionally, when too wet; and a little water was added when necessary. The plasmodia revived at several places, fused, and traveled back and forth between the lower layer and the upper wood, meanwhile growing in size. When sufficient plasmodium appeared on the larger piece of wood, it was taken out of the jar and placed at one side of a seven-inch dish, on wetted filter paper over which some food had been strewn. Within 24 hours, the greater part of the plasmodium had left the wood and was on the paper. The wood was then removed and placed back into the jar for a further supply. The separation of the plasmodium in removal does not injure it, as the lesions close in a short time. There was now a clean yellow plasmodium on a background of white filter paper, which grew rapidly and filled the dish in less than a week. In this manner, five large dishes were filled by successive withdrawals from the jar, and more might have been prepared but for the termination of the experiments. The wood in the jar remained remarkedly free from other organisms such as insects, nematodes, fungi, and molds, which often prevent the development of plasmodium, and it is probable that much of the success was due to the absence of those forms. It was on this wood in the jar that the 30 sporangia appeared.

All plasmodia were kept wet during the period of vegetating; and all were fed regularly, including the one in the jar. Various grains and cereals, corn, oats, wheat, barley, rye, buckwheat, and hemp were tried as food. They were obtained in a raw, uncooked

condition, and ground into meal in a small mill. The powder was sprinkled sparingly, through a finely meshed sieve, over wood, paper, and plasmodium, at intervals of two days. It was found that they responded best to the corn meal, and this was used exclusively when it was determined. All of the foods, when placed on the wetted paper, produced an enormous number of protozoa of various kinds, and it was evident that many of these were absorbed by the plasmodia and perhaps are the real basis of value in the foods used.

Other exhibits consisted of sclerotium in wood; plasmodium on wood; tracks of débris left by the progressing plasmodium; examples of spores in mass; and numerous specimens of the fruiting bodies, the last shown under binocular microscopes. All were arranged with descriptive cards and a short story of the life history of the Mycetozoa.

To one who desires to prepare spore cultures and plasmodium of the Mycetozoa, for exhibition purposes, the advice is given that results are not always uniform with material of the same species. Much depends upon the viability of the spores, the condition of the sclerotium, and the species itself. A sufficient amount of fresh field material, of as many species as possible, should be obtained. Experiments should be commenced early enough and with different species so that a selection of the most suitable can be made. There are no difficult problems involved, and with care and attention to details, satisfactory results may be obtained with many species.

ROBERT HAGELSTEIN.

A GLANCE AT CURRENT LITERATURE*

"Speeding Up Flowering in the Daffodil and the Bulbous Iris" is the title of Circular 367 of the United States Department of Agriculture, prepared by the late David Griffiths on the basis of the most recent experiments. Tulips are the subject of Circular 372, by the same author. Both are essentially bulletins for commercial growers.

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* All publications mentioned here—and many others—may be found in the Library of The New York Botanical Garden, in the Museum Building.

Dahlias, their history, classification, and culture, their diseases and insect pests, are treated in Special Bulletin 266, published by the Agricultural Experiment Station of Michigan State College. The 83 pages contain a long bibliography, list of definitions, and much practical information.

* * *

Dr. J. H. Nicolas writes emphatically about bonemeal in the March-April number of the *American Rose Magazine*. Differentiating carefully between plain bonemeal and *dissolved* bonemeal, he says, "A dime's worth of nitrate of soda would produce as much effect as will dollars spent for bonemeal! If phosphoric acid is desired . . . a little superphosphate . . . which is soluble, will turn the trick at very low cost." He refers further to Cornell University Bulletin 281, and quotes Professor Raymond C. Allen of Cornell in part: "It is my contention that those who recommend bonemeal strongly usually get their good results in spite of the bonemeal rather than because of it."

* * *

"A moist surface is absolutely essential for the successful culture of house plants in clay pots."

This statement comes from Linus H. Jones of the Agricultural Experiment Station at Amherst, Mass., through an article in the *Florists' Exchange* for April 11. It was Mr. Jones who, a few years ago, through exhaustive experiments, proved the value of non-porous pots for house-plants. But as long as clay pots are continued in use, his latest experiments have proved, a moist surface will greatly improve the vigor and blooming capacity of the plants. A special mat for holding moisture, made partly of leather, has been developed by the experiment station.

* * *

In expressing the viewpoint of the Arnold Arboretum on the Dutch elm-disease situation, J. H. Faull concludes a statement in the April *Bulletin of Popular Information*: "Notwithstanding these criticisms, the Arnold Arboretum holds fast to the adopted policy of eradication and its attendant sanitation project. . . . But there must be unflagging persistence and continuity of endeavor. Our purpose can be attained if we express an interest that will command the leadership and basic support of Congress."

A new species of *Sedum,* from Texas, *S. Robertsianum,* is described by E. J. Alexander in the April *Bulletin of the Torrey Botanical Club.* In the same issue, Michael Levine presents further reports of his interesting work on the response of plants to localized applications of various chemical agents.

* * *

A paper completed shortly before the death of Dr. Britton has just been published by the New York Academy of Sciences. It is "Mimosaceae and Caesalpiniaceae of Colombia" by N. L. Britton and E. P. Killip. Originally, J. N. Rose began the study of these families with Dr. Britton, working on them until his death in 1928. Three years later Dr. Britton asked Mr. Killip to continue the work with him, and the manuscript was completed in 1934.

* * *

One of the gems of Asiatic alpine flora discovered in northwest Yunnan by George Forrest and brought back for cultivation, is described in the *Gardeners' Chronicle* for February 29. It is *Paraquilegia* (formerly *Isopyrum*) *grandiflora,* of which Forrest wrote: "For these, if for nothing else, it is well worth while to have visited the Da-Tung Alps." It is to be seen now in several European gardens and is worth attempting to introduce into America.

* * *

Plant ecology is used as a basis for landscaping small properties, as well as estates and parkways, with native plants, in suggestions offered by Frederick L. Witt in an article, "Grouping the Natives," which appears in the *Gardeners' Chronicle of America* for March. A simple landscaping plan for a suburban back yard is presented, and lists are given of ground-covers, ferns, trees, shrubs, and herbaceous plants which occur together in the wild.

* * *

Ralph Waring, in "Better Delphiniums for American Gardens" in the *Gardeners' Chronicle of America* for May, tells of the development of new varieties, especially bluer types, how to raise them and what to expect of them in the garden.

* * *

A noteworthy contribution to the subject, "The Rôle of Light in the Life of Plants" was contained in the January and March numbers of *The Botanical Review.* The author, Paul R. Burkholder of Connecticut College, divides the topic into (I) Light

and Physiological Processes and (II) The Influence of Light upon Growth and Differentiation, treating in the second half the responses of the cells, tissues, and organs individually, as well as the plant itself under different conditions of light. Six hundred references are cited in the text and listed alphabetically at the end.

CAROL H. WOODWARD.

NOTES, NEWS, AND COMMENT

Boris Krukoff, who spent the winter exploring the upper reaches of the Amazon, has returned to New York, bringing with him an extraordinarily complete collection of herbarium specimens illustrating plants of which he has been making special studies. He has undertaken a series of investigations of plants used in the production of rotenone, which is of increasing importance as an insecticide. He is also working on various species of the genus *Strychnos,* interesting as the source of strychnine and for its use by the South American Indians as an arrow poison. He plans to return soon for further investigations, going directly to his headquarters at Manaos, Brazil, where he has established a laboratory and testing ground for these plants.

* * *

Captain F Kingdon Ward, noted for his botanical explorations in Tibet, Upper Burma, and southern China, as a result of which many important horticultural plants have been brought into cultivation, visited New York in May as the guest of C. S. Cutting. While here he made many visits to The New York Botanical Garden, and on May 20 he gave an illustrated address in the Museum Building before the Torrey Botanical Club.

* * *

The work of expanding the herbarium at the Garden is now completed, with space provided for the accumulation of material for three years in the future. Fifteen hundred boxes of corrugated paper have been set up as temporary herbarium cases until others of more permanent nature can be provided.

* * *

The lawn southwest of the Museum Building, which was destroyed by construction last winter of the new steam trench, has now been filled in with new earth, graded, and planted, in anticipation of a broad expanse of green before the end of the summer.

Visitors to the Thompson Memorial Rock Garden have exceeded all expectations, and during the height of the season, beginning the middle of May, experienced gardeners eager to study individual plants, novices interested in the layout of the garden and in the types of flowers used for massing, and flower-lovers who wanted to see the effect of the whole because of its beauty came in great numbers on week-days and crowded the place on Sundays. Many new plants will continue to come into bloom for about two weeks more; then, while flower and foliage effects will not cease to be interesting, the best of the year for the rock garden will have passed by early July. The rock garden is open week-days from 8 a.m. to 4:45 p.m. and, for the present, on Sundays and holidays from 10 a.m.

* * *

Dr. E. Silver Dowding Keeping of the University of Alberta, in Edmonton, visited The New York Botanical Garden May 12 on her way to Europe, where she will pursue some studies at Kew and other institutions. While Dr. Keeping's specialty is the dermatophytes, or fungi producing skin diseases, she has made notable contributions to the subject of reproduction among the fungi.

* * *

Dr. W. H. Camp left New York the last of May for a two-months' collecting trip in the southern Appalachians, during which he will give particular attention to the Ericaceae and Vacciniaceae of the region.

* * *

At the conference of the Scientific Staff and Registered Students of the Garden on April 23, Dr. Forman T. McLean spoke on "Inheritance of Fragrance in Gladiolus" and Dr. A. B. Stout, Miss Clyde Chandler, and Dr. W. M. Porterfield reported on "Experimental and Cytological Studies of *Lilium tigrinum*."

* * *

Professor Charles Chupp of Cornell University recently spent a day in the mycological herbarium looking over specimens of Cercospora, a genus of parasitic fungi represented by several hundred species, many of which are destructive to the higher plants. Professor Chupp has been specializing in this group for some time and it is expected he will write these forms for *North America Flora*.

REVIEWS OF RECENT BOOKS

GARDENING ALL THE YEAR 'ROUND

It is a delight to find a new gardening book[1] engaging to look at, because of innumerable excellent photographs; engrossing to read, and full of practical, easy-to-grasp information.

John C. Wister, whose name is already well known to experienced gardeners throughout the country, has written a book which carries the amateur through four delightful seasons of gardening outdoors and in. The pictures selected would make any novice yearn to become a gardener; the text could not help but make him a successful one. For Mr. Wister gives warnings at the proper time, and offers encouragement where it is needed. As to plants, he gives full credit to the old-fashioned standbys in the garden, but at the same time urges the use of new material, suggesting plants of all types—annuals, perennials, bulbs, aquatics, vines, shrubs, trees, and ground-covers—which are not yet as widely used as they should be for garden beauty. He tells how to start gardens of several types and how to handle each kind of plant mentioned. His definition of a bulb as "really a thickened leaf or root stock" is scarcely accurate, and it is regrettable that one illustration, obviously of a crucifer (apparently *Arabis*), should be labeled *Saponaria*, but, all in all, "Four Seasons in your Garden" is an exceedingly practical and delightful book.

NOT FOR AMERICA

It will be an important year when American publishers realize that English gardening books are not suitable for the United States. They may be all right for Washington and Oregon, but gardeners in some 20 other northern states are going to be disappointed if they expect to find five beautiful shrubs in bloom from December through February, if they look for their first daffodils outdoors before March, or if they expect such shrubs as Garrya, Osmanthus, and Olearia to live through the winter. All these and many others are recommended in Richard Sudell's

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[1] Wister, John C., Four Seasons in your Garden. 306 pages, 64 photographs, 64 drawings. J. B. Lippincott Co., Philadelphia, 1936. $2.50.

latest book, "The New Garden,"[2] printed in England but put on the market by Scribner of New York. It is a perfectly good book in its place—though it goes into considerable structural detail for the building of walls, steps, tennis courts, formal pools, and other features requiring stone and cement—but how is the amateur gardener (for whom the "how" books presumably are written) to know that the place of this book is in a mild moist climate like that of England? It is unfair to the eager but innocent novices of this country to offer them without warning a book that is wholly unsuited to their American climate of extremes.

UP-TO-DATE WORKS ON FLOWER ARRANGEMENT

Styles in flower arrangements have changed considerably in only the past few years; and since competing for prizes at flower shows through skillful grouping of plant materials has become a major activity for many people, new versions of two of the best of former books on flower arrangement are especially welcome.

Professor Edward A. White's work[3] has long been a standard reference on the subject. This latest edition (the third) presents considerable new material, based on recent trends as he has been able to observe them while working with students and judging at flower shows.

The book contains an important and helpful list of plants available for flower arrangements every month in the year, from the wild, from cultivated shrubs and vines, from among garden flowers of different types, and from the greenhouse. He tells how to cut flowers and how to handle them, and into what sort of containers to place them, pointing out that styles in containers are among those things which have changed. He explains the Japanese ideal in flower arrangement, outlines effectively the principles of design from the point of view of form, notan, and color, and takes up, besides single table decoration and holiday designs for doorways, such large-scale compositions as floral work in churches, banquet halls, and auditoriums. The discussion of colors and tones is especially comprehensive, because the theories are carried out with clarifying examples.

Mrs. Hine's new book[4] begins where her former book, "The Arrangement of Flowers," left off. Thus much of the theory, except for an opening recapitulation, is omitted. The rest of the

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[2] Sudell, Richard, The New Garden. 348 pages, illustrated. Charles Scribner's Sons, New York, 1936. $2.

[3] White, Edward A., Principles of Flower Arrangement. 199 pages, 70 photographs, drawings, and color chart. A. T. De La Mare Co., New York, 1936. $3.

[4] Hine, Mrs. Walter R., New Flower Arrangements. 159 pages, 50 photographs. Charles Scribner's Sons, New York, 1936. $2.75.

book is composed of suggestions, well illustrated with photographs, for the arrangement of exotic plant material, winter subjects, weeds, flowers from the florist shop, and growing plants. Emphasis is placed on unique designs, usually of about three subjects in a container. To many the most helpful section of the book will be the last chapter, which tells in detail how to arrange a small flower show competition that will be inexpensive, inspirational, and instructive.

Someone has been careless in letting "horticulturalist" be used in place of horticulturist, and "credible" in place of creditable; also in permitting repeated misspellings and incorrect capitalization of plant names. A dozen such errors were found at a glance in one chapter of six pages . . . and they were not all. Such errors detract from a book which is otherwise beautifully composed.

FOR CHILDREN AND OTHER BEGINNERS

If a young boy and girl were not pictured on the jacket of "The Gardener's First Year,"[5] one might not immediately guess that Alfred Bates' book was intended for children. Not that a 12-year-old—or even a younger child—would not understand it, but rather that it is so simply and clearly written that many a grown-up who has puzzled over the whys of some of the first steps in gardening may, through this book, gain a useful fundamental knowledge.

Directions for starting a garden and for caring for it through the summer tell clearly why each step is taken and explain how it is done. There should be no false moves by the veriest beginner who follows this book.

The section dealing with elementary botany, explaining what a flower is, and the part telling why and how plants are given botanical or Latin names, should be the envy of many a teacher who has tried with much less effectiveness to make these simple facts interesting and understandable.

While the book deals only in fundamentals, going no further than annuals that will bloom the first year from seed, it gives the first-year gardener a sound start for future years of joy among his plants.

CAROL H. WOODWARD.

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[5] Bates, Alfred, The Gardener's First Year. 246 pages, illustrated. Longmans, Green & Company, New York, 1936. $2.

PUBLICATIONS OF THE NEW YORK BOTANICAL GARDEN

An Illustrated Flora of the Northern United States and Canada, by Nathaniel Lord Britton and Addison Brown. Three volumes, giving descriptions and illustrations of 4,666 species. Second edition, reprinted. $13.50.

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pages and 601 figures. 1932. Price, $5.50 postpaid.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages. 1935. $1.65.

Flora of Bermuda, by Nathaniel Lord Britton and others. 585 pages with 494 text figures. 1918. $3.50.

A Text-book of General Lichenology, by Albert Schneider. 230 pages: 76 plates. 1897. $2.50.

Mycologia, bimonthly, illustrated in color and otherwise; devoted to fungi, including lichens, containing technical articles and news and notes of general interest. $6.00 a year; single copies $1.25 each. Now in its twenty-eighth volume. Twenty-four Year Index volume $3.00 in paper, $3.50 in fabrikoid.

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JOURNAL
OF
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THE HYBRIDS OF CLEMATIS TEXENSIS
J. E. SPINGARN

GANGSTERS AMONG TREES
JOHN K. SMALL

THE RED AZALEA OF BLACK MOUNTAIN, KENTUCKY

A STEM-ROT OF EUPHORBIA LACTEA
B. O. DODGE

SUMMER MEETINGS OF SCIENTISTS

A GLANCE AT CURRENT LITERATURE
CAROL H. WOODWARD

NOTES, NEWS, AND COMMENT

REVIEWS OF RECENT BOOKS

CLEMATIS
GENTIANS
LILIES IN THE GARDEN
FIRST GOURD BOOK
CAROL H. WOODWARD

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JOURNAL
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THE HYBRIDS OF CLEMATIS TEXENSIS

AND OF OTHER AMERICAN CLEMATIS SPECIES

The purpose of this brief article is to call attention anew to the beautiful hybrids of our native *Clematis texensis,* and incidentally to record the work that has been done in hybridizing other American species of *Clematis.* The *texensis* hybrids, though fairly common in Europe, have been lost to us for many years, but are now again available to the American gardener.

Until the 1890's all the large-flowered clematis hybrids were derived from three Chinese species,[1] *C. florida, C. patens,* and *C. lanuginosa,* and one southern European species, *C. Viticella.* For more than thirty years European hybridists had been busy in crossing these species and their varieties, and had produced the typical large-flowered hybrids with their open, flat flowers such as gardeners recognize in *Jackmani, Henryi,* and the like. But these hybrids were beginning to show signs of decadence, perhaps as a result of continuous vegetative propagation. The dreaded "clematis wilt," as it was then called, had made its appearance; and it was felt that it was necessary to introduce new blood into the group. If this was not accomplished in the widest sense, at least a new type of large-flowered hybrid was created.

This new blood was found in an American species, a native of Texas, *C. texensis.* This is one of the most beautiful of our native plants, and is in itself worthy of a place in the proudest garden. It was first collected in Texas in 1850, and was introduced into English gardens apparently before 1870; but it did not reach American gardens until some years later, so slow have we

[1] *C. florida* and *C. patens* were first discovered in Japan, and botanists have always assumed that at least one of them was a native of that country. But it would now appear that both are of Chinese origin; see my article on "Clematis in Old Japan" in the *Gardeners Chronicle,* London, January 18, 1936.

been to appreciate our own flora. Engelmann named it *C. coccinea,* but as the name does not seem to have been published by him, though it was ascribed to him in print by Gray three years later, the name given it by Buckland in 1861, *C. texensis,* is now regarded as official. Gray himself at first called it *C. Viorna* var. *coccinea.*

C. texensis is hardy as far north as Bar Harbor, Maine, and it has flowered at Ottawa. It is a brilliant sight when in bloom. The flowers are urn-shaped or pitcher-shaped, and bright scarlet to rose-pink in color, or, to use Ridgeway's terms, begonia-rose to spectrum-red on the outside, and pale pinkish-buff, sometimes flushed geranium-pink, on the inside. They bloom from June to frost, at first in a great outburst, and then more sparingly throughout the summer. The plant dies to the ground in winter, but sends out more and more shoots each year until it is able to drape a trellis ten feet high and as many or more feet wide. It can be grown from seed, but the seed is slow in germinating (8-15 months); and care should be taken to obtain a good strain, for drab and dingy forms are not uncommon, and most European seedsmen seem to have no other.

It was this species that the hybridists began to use as a parent of new clematis hybrids. As early as 1893 Max Leichtlin of Baden-Baden had crossed *C. texensis* with the Chinese species *C. lanuginosa;* and in France Edouard André had crossed it with another American species, *C. Pitcheri* (syn. *C. Simsii*). But these hybrids made no impression on the horticultural world, and I can find no evidence of their survival.

In June, 1894, the first successful hybrid of *C. texensis* made its appearance. The well-known English nurserymen, George Jackman & Son, creators of *Jackmani* and other varieties, exhibited Countess of Onslow, which received a first-class certificate from the Royal Horticultural Society. This was a cross between *C. texensis* and a reddish-plum to violet-purple hybrid of the *Jackmani* type called Star of India. Soon after this they introduced several other *texensis* hybrids: Duchess of Albany, Duchess of York, Grace Darling, Sir Trevor Lawrence, and Admiration. All of these were grown in American gardens at one time or another, but they seem to have been forgotten for many years, and it was impossible to obtain them in American nurseries. It will be good news to many to know that five of the six are now

Photograph by Walter Beebe Wilder.

FIGURE 1. *Clematis texensis*, a native of Texas, and one of the most beautiful of American species of Clematis.

commercially available in this country, and I urge all lovers of beautiful plants to give them a trial.

They differ radically in shape from all the other large-flowered hybrids. They have retained something at least of the shape and color of *C. texensis,* but the flower is larger and somewhat more open. The half-closed calyx of *C. texensis* has been extended into a large trumpet-shaped flower. All of them retain more or less the foliage of *C. texensis,* with leaflets somewhat smaller and more delicate than most of the other large-flowered hybrids. The scarlet or rose-pink color of the Texas climber has been modified; some are paler, some flushed with white or with violet-purple, some are richer and darker, but the color of their American parent limits their color range to scarlet, crimson, and pink, for the most part. Nothing could be more graceful than the plants when in bloom. As I have said elsewhere, they have something of the airy grace of their wild father and something of the dignity of their cultivated mother.

Countess of Onslow was described by the introducer as bright violet-purple with a broad band of scarlet down the centre of each sepal; but Ridgeway would describe the young flower as Bordeaux flushed with pomegranate-purple on the inside, and Thulite-pink to spinel-pink shading to sulphur-yellow on the outside. Duchess of York is pale blush-pink with a deeper tinge down the center of each sepal; Duchess of Albany, bright pink with a deeper tinge down the sepals and a softer tinge at the margins; Grace Darling has star-shaped flowers of a delicate shade of rosy-carmine; Admiration is deep salmon edged with violet, and Sir Trevor Lawrence, one of the most attractive though the most difficult to procure, is deep crimson.

Like their Texas parent they die down to the ground each winter and increase in size year by year. All are hardy in Dutchess County, New York, though Countess of Onslow seems of somewhat less rugged constitution than some of the others. *C. texensis* grows in alkaline soil along rocky and shaded banks in Texas, and these hybrid progeny seem to love lime too. They are adapted to almost any garden purpose, on trellis, post, or fence, and they might not appear out of place even in the wild garden; but their charm gives them a right to the proudest position.

These are the only *texensis* hybrids that have survived in gardens, but not the only ones to be created. French horticul-

Photograph by Donald F. Merrett.

FIGURE 2. Clematis Grace Darling, one of the very attractive hybrids of *C. texensis,* the flowers of which are a delicate shade of rosy carmine.

turists, using *C. texensis* as a parent, produced Madame Raymond Guillot, Madame Moret, and Madame Lerochet, but I have not been able to trace their later history. In our own country, at the beginning of this century, Luther Burbank produced a number of unnamed *texensis* hybrids, and they were offered for sale by the Chicago seedsman, J. C. Vaughan, between 1903 and 1905, but they have disappeared from cultivation and have left no trace. An account of them may be found in the tenth volume of an amorphous work on *Luther Burbank: His Methods and Discoveries,* published in New York in 1915.

C. texensis has been crossed with other American species, such as *C. crispa* and *C. Pitcheri* (*C. Simsii*), and Otto Froebel of Zurich produced at least fifteen named varieties in this way, but they are of course in no sense large-flowered. So also *C. crispa* and *C. Pitcheri* have been crossed with each other and with other species. To this group belongs *C. divaricata,* which is supposed to be a cross between *C. Viorna* and *C. integrifolia,* though the name is also regarded as a synonym of *C. crispa.* The Viorna section of the genus is confused and difficult, and natural hybrids seem to abound. They offer excellent material for the hybridists of the future.

At the present time perhaps the most promising work is being done by Canadian hybridists in their search for hardier strains that will endure the severe climate of the north. They are using both American and foreign species, in some cases crossing hardy species with pollen imported from milder climes. Mr. F. L. Skinner, of Dropmore, Manitoba, has produced an interesting plant by crossing our western species, *C. ligusticifolia,* with the yellow Chinese species, *C. serratifolia;* and among foreign species, he has crossed *C. integrifolia* with *C. Viticella* and with large-flowered hybrids, but this is another story. More work of this sort remains to be done, but it must be done with discretion and taste as well as with skill. The mere multiplication of uninteresting hybrids does not serve horticulture.

J. E. SPINGARN.

GANGSTERS AMONG TREES

HOW THE STRANGLING-FIG KILLS

The strangling-fig is a strange tree—a sort of boa-constrictor of the plant kingdom, however *ad libitum.* Not the least peculiar fact about it is that it can live a simple life anchored in the ground independently just as well as on a host. Furthermore, it has the ability to change from a terrestrial to an epiphytic habitat and *vice versa.* The climax is reached when the strangler has finished its task on a victim and then turns about and strangles itself. Such cases are not uncommon in the dense hammocks of southern Florida. However, if by chance it starts its existence as an epiphyte instead of directly from the ground, roots and branches are devel-

FIGURE 1. A cabbage-tree—*Sabal Palmetto*— in the Deering Hammock, Cutler, Florida, showing where a strangling-fig—*Ficus aurea*—has sprouted about halfway up the trunk. It will be noticed that the strangler has sent aerial roots up and down the trunk, and also out toward other plants. The three cabbage-trees shown in this article grow close together in the hammock and are growing on solid rock.

oped, and usually it is ultimately successful in strangling its original host and benefactor.

The fig is wide-spread in tropical and nearby regions. Its record pre-erved in the sedimentary rocks shows that as a type it has had a very long existence in geologic time. Its vital routine now indicates a prolonged existence in the future. It produces great quantities of fruits and incalculable numbers of seeds, its seeds sprout with ease, the resulting plants are tenacious of life. All of them will grow in the ground; many of them will also grow on other trees or on rocks!

Through its long history the fig, especially the one of poetry and commerce (*Ficus Carica*) produced many constituents, internal products which are of great use to man, also fruits for food and forms for ornamental uses. In addition certain species have developed curious habits of growth among which may be mentioned the *strangler* and the *usurper*. The former destroys its associates by enveloping them, the latter by crowding them out.

Consider our native strangling-fig (*Ficus aurea*) as it develops and later works ruin to its victims. This tree in various regions is ubiquitous. It occurs naturally in swamps and dry pinelands, but its favorite haunt is the tropical hammock with its possible victims clo-e at hand.

As intimated above, this tree gives no evidence of increasing the list of extinct species at an early date. Its myriad seeds sprout abundantly in all kinds of places. In the various natural habitats, the germination is not very evident to the passing eye, for the seedlings are usually hidden by other vegetation. An artificial habitat, such as a ditch-bank or a canal-bank, either one of rather recently upturned materials, will show how the seeds strive to continue the existence of the species.

A number of birds are very fond of the fig fruits. After eating the fruits in flitting from rock to rock or clod to clod on a ditch bank they drop the seeds, which soon sprout. Consequently one usually finds ditches, canal banks, or roadsides lined with young strangling-figs, the plants varying from an inch to twenty feet high or more. Such plants as are able to contend successfully with their natural or artificial environments may grow into very large trees firmly rooted in the sod, with no intimation of their possible inborn epiphytic and strangling propensities.

FIGURE 2. A cabbage-tree growing in close association with a strangling-fig. The strangler has sent up four large and some smaller trunks. It has also begun to throw loops around the palm. The ultimate fate of the palm will be something as shown in FIGURE 3, for these separate trunks of the strangler have the habit of coalescing into a single trunk.

FIGURE 3. A neighbor of the cabbage-trees shown in FIGURES 1 and 2. Here the strangler has made its task almost complete. The trunk of the palm is completely enclosed, only the crown emerging from the tomb. In addition the strangler has prospered and thrown up a large branching trunk for itself high above the hammock roof.

In a hammock where a very different environment obtains, the birds may again be agents of seed dispersal, or wind or gravity may help to lodge a fruit or a seed on another plant. After the seed sprouts on a tree, trunk or limb, the tree, no matter how large and strong, is very likely doomed. A sapling broad-leaved tree or a giant live-oak or a palm is meat for the strangler.

Several examples of a strangling-fig in the different stages of action once came to our notice in the Deering Hammock at Cutler, Florida. The palms shown in FIGURES 1, 2, and 3 grew close together at least in sight of one another. The specimen shown in FIGURE 1 is a host upon which a strangler has rather recently started its epiphytic existence. The beginning seems to have been at a point about half way up the trunk. After taking a firm hitch around the trunk, roots went down and up, and reached out in the direction of other plants. Where a strangler starts or where it directs its early root-growth does not necessarily indicate where it will finally be most active in the work of destruction. Its growth may work downward to carry on most actively or it may work upward, or roots may pass over to destroy a tree some distance removed from the one on which the seed germinated and from which it might disappear, thus leaving its original host unharmed.

In the case of FIGURE 2, a strangler has confined most of its activity to the basal part of a palm. In its career it has surrounded the base of the trunk and made several firm hitches around its victim. So far the fig growth has not enveloped much of the trunk, but has grown up into tree form with several large stems and some smaller ones on either side of the palm-trunk. What its future antics may be no one can tell in advance.

FIGURE 3 might well represent a future stage of the strangler shown in FIGURE 2. Here the roots and branches have completely enveloped the palm-trunk up to the crown of leaves. The prodigious energy of the fig, and its ability to take much nourishment from a scant source may be realized from the fact that it is growing on rock instead of in soil, and by observing the two heavy stems it has produced on and above the top of the strangling sheath about the palm-trunk. By a little imagination one can construct the three figures into three stages of the same fig and the same host-victim.

JOHN K. SMALL

THE RED AZALEA OF BLACK MOUNTAIN, KENTUCKY

Exploring the summit and slopes of Black Mountain in Kentucky, Dr. W. H. Camp, who is spending two months in the southern Appalachians, found on June 17 the red azalea which was one of the many objectives of his expedition. Living plants for the Thompson Memorial Rock Garden, flowering sprays to be painted for *Addisonia*, and herbarium specimens for The New York Botanical Garden and for exchange reached New York within three days after his location of these plants.

While this deep-red azalea has been previously reported from certain spots in the southern Appalachians, it is not yet generally known by botanists, and this is the first time that fresh material has reached the Garden.

After describing the difficult mountain trail to the site of this plant, Dr. Camp writes in a letter to Dr. H. A. Gleason:

"I saw the red azalea. In the sober moments next winter, when I have the cadavers of these plants before me—when my saner judgment may prevail—these specimens may be relegated to a sub-species of the ordinary flame azalea—or more probably to a variety or even a form. But now they are something else. I have seen the flame azalea in the Chilhowees and in the Smokies—I will see it again—but the thing I saw today was something which stands apart from all the others. Oh yes, I will admit that the 'flame' azalea occasionally throws reddish forms—forms even with a lot of red, so red that they are orange—and some of *these* are orange, showing the link with *lutea* (*calendulacea*). But, predominantly they were red, a warm, glowing, living red. The only way I can get the idea across is to have you imagine that you had an azalea with a warm lemon-yellow color. Now dip it in scarlet—and it turns orange, a warm orange, much warmer than the scarlet alone. Now dip it again and again in the scarlet, and with each dipping shift the color toward a deeper shade until it is a black-red. That is the color of many of the plants. Some haven't been dipped so often—and these are a startling contrast—but the majority were deep red—a warm, living, flaming red—and just as red in the forest shade as on the open meadows at the top of the mountains. Shrubs 3 to 7 feet tall, massed or scattered individually on either side of the trail.

"I hated so to leave the mountain top, but I had left the car on the main trail and had wandered down one of the spurs. It had been a hot day, the ridge is bone dry, and thunder-heads had been accumulating in the west. There was a rift in the leaden cloud bank and the sun, just as it slipped back of the mountains, gave one last burst of golden light. The valleys, thousands of feet below, were already purple with twilight haze. Then at the very moment when the sun, rimmed with golden fire, became a blazing glory, turning all the clouds to pink and gold, I came around the shoulder of the mountain and onto a little meadow where hundreds of these plants were massed together in full bloom. The meadow sloped toward the west and caught the full brilliance of that golden light."

A STEM-ROT OF EUPHORBIA LACTEA

Succulent Euphorbias in greenhouses apparently are seldom affected by fungous diseases. An examination of four of our most popular publications on diseases of ornamentals has failed to disclose any mention of fungi or bacteria attacking a species of *Euphorbia*. We were therefore somewhat concerned last winter when the gardeners in charge of the succulents in Conservatory Range I reported a rather serious stem-rot of *Euphorbia lactea*, particularly of the variety *cristata*. Dark-colored or blackish, rather soft, rotted areas would appear in a branch and the disease would eventually spread until it killed that branch. It was suspected at first that the trouble was due to some bacterial infection.

While the rot was not a very wet one and it was not foul smelling, it certainly presented the appearance of a bacterial disease. Bacteria were isolated from some of the rotted spots, but it was proved by inoculation experiments that the bacteria isolated were not the primary cause of the trouble. Breaking open a rotting branch one could often see mycelial threads of a fungous growth. Pure cultures from this growth were obtained. The species has not been definitely determined but the parasite belongs to the genus *Coniothyrium* which has small black fruit bodies with quantities of minute dark-colored spores. It may be *C. Euphorbiae*, which has been reported on living leaves of certain Euphorbias in

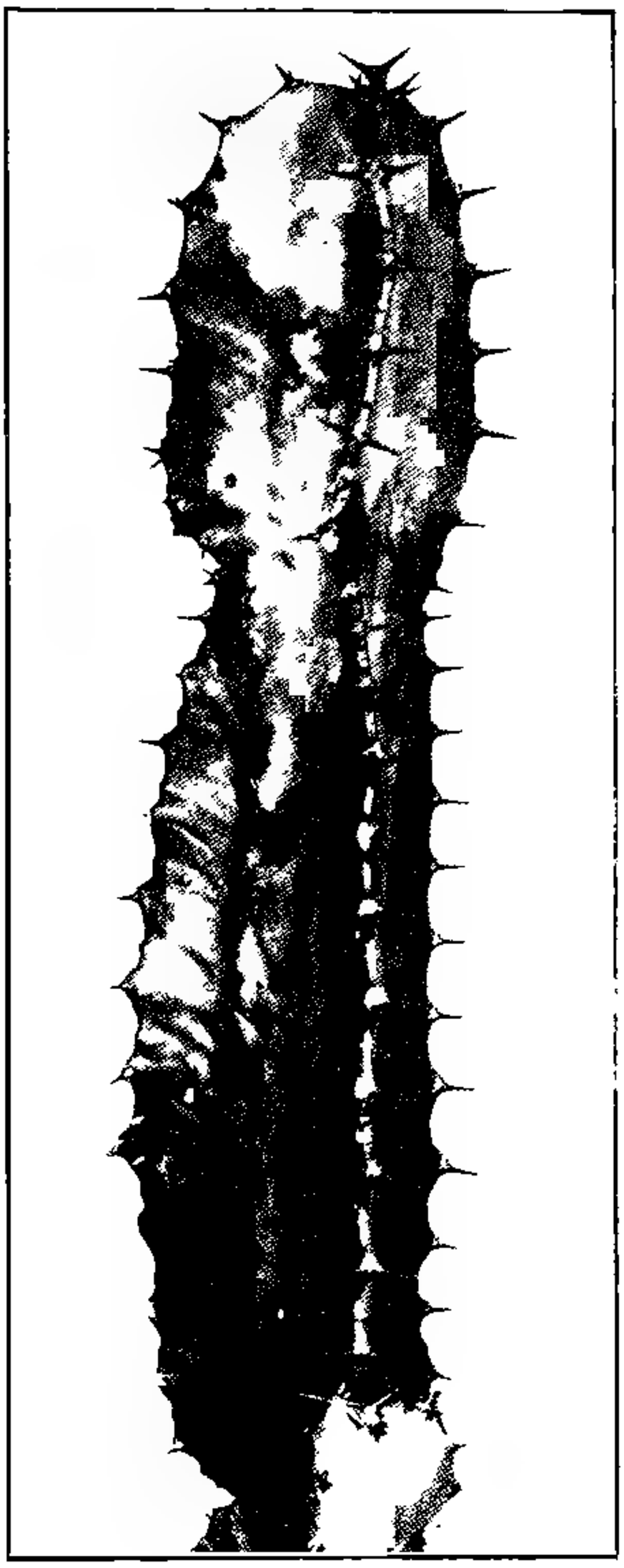

FIGURE 1. Left, a branch of *Euphorbia lactea,* on which black streaks reveal the early stages of the stem-rot caused by the fungus *Coniothyrium.* Right, a small plant of *Stapelia gigantea* showing an end rot.

Europe a number of times. We have found no reference to a stem-rot caused by this species.

A number of inoculations of *Euphorbia lactea* var. *cristata* with the fungus isolated have resulted in the same type of rot. The fungous parasite quickly spreads through the healthy tissue and later fruits abundantly on the surface. FIGURE 1 shows an end branch at an early stage of the attack. Later the whole branch rotted and one could then see hundreds of the small black spore-

horns coming out of the fruit-bodies which are somewhat embedded in the host tissue. These structures are only about the size of the eye of a needle. The spore-horns, shown in FIGURE 2, are forced out through small openings in the fruit-bodies and often coil about more or less before drying out. The spore-coils persist for a long time unless they are washed off with water. The number of spores contained in one of these horns is astonishing. In case of the old chestnut-blight fungus, it was determined that each spore-horn is composed of about 1,500,000 spores. One can see from our figure that there are hundreds of these black spore-coils thickly distributed, so that the number of spores that would be scattered in a greenhouse while the diseased plants were being watered would be enormous. The fact that only an occasional plant becomes infected is proof that the fungus has much difficulty in gaining entrance through the cuticle into the host tissues. The mycelial threads are probably unable to penetrate the cuticle directly. Some wound is very likely necessary.

It is clear that the spread of the disease could largely be prevented by cutting off and destroying the rotting branches. Since the fungus is well protected once it has gained entrance into the tissue, spraying with a fungicide would be of no avail, except to

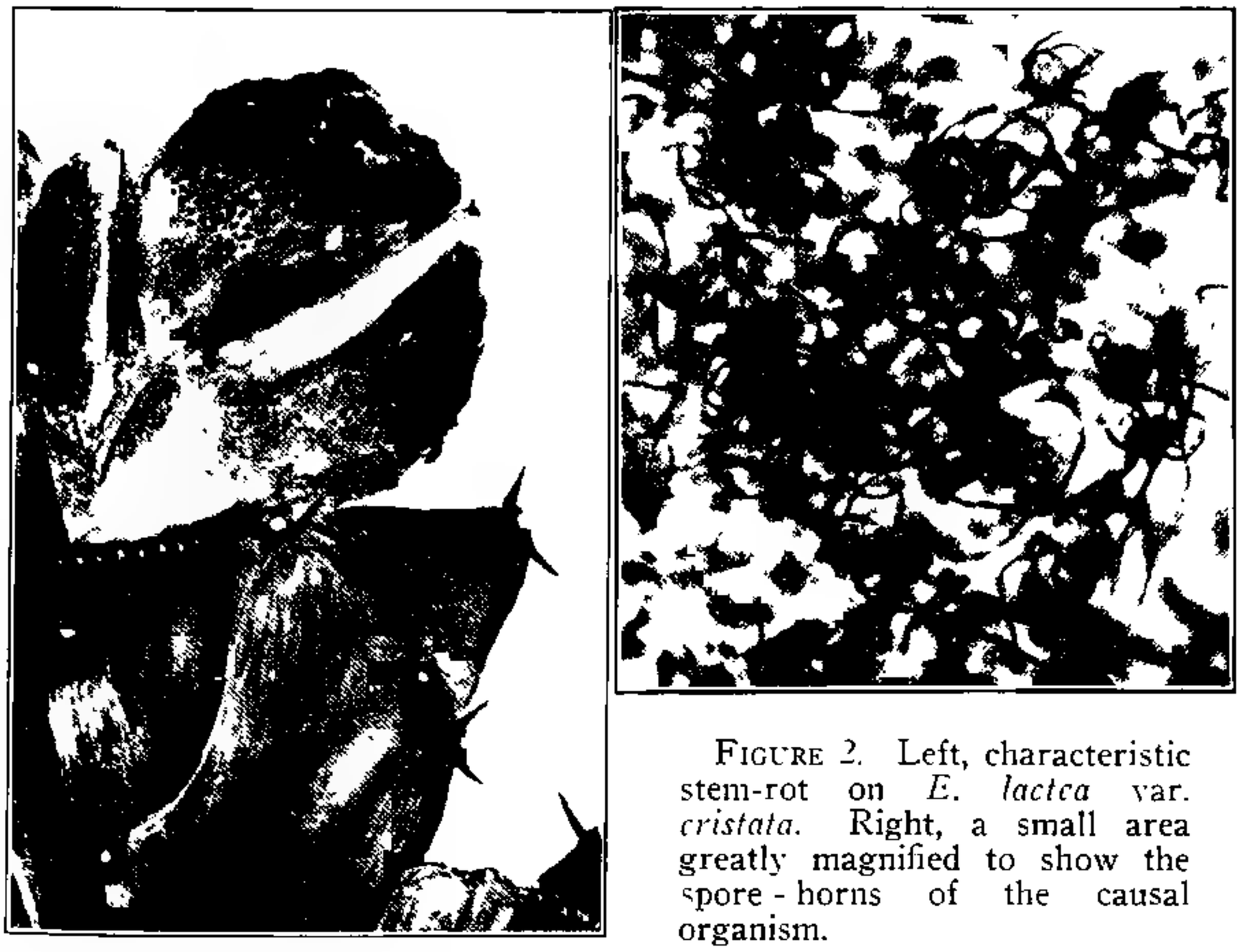

FIGURE 2. Left, characteristic stem-rot on *E. lactca* var. *cristata*. Right, a small area greatly magnified to show the spore-horns of the causal organism.

prevent further spread. In case such species of *Euphorbia* should be grown on a large scale, the disease would be a serious problem.

In Seymour's very complete host index of fungous diseases of North American plants no mention is made of a *Coniothyrium* disease on a species of Euphorbia. *Acalypha bisetosa,* a species of the Euphorbiaceae, is, however, reported by F. L. Stevens to harbor a species of *Coniothyrium*. Most members of this family are more susceptible to attack by species of rust and downy mildew. Fruit growers are only too familiar with the cane blight of raspberries and blackberries caused by a *Coniothyrium*. There are also two rose-stem canker diseases caused by related fungi.

Last winter we had some trouble with the common gray mold, *Botrytis,* on one "double" variety of poinsettia, *Euphorbia pulcherrima*. The blossom-ends attacked often failed to open properly, turning brown and finally rotting. It was necessary to discard a number of plants on this account. The attack was thought to have been due to faulty aeration or to the low temperature prevailing in that house. Plants of another variety in an adjacent house were not attacked. *Botrytis* on *Euphorbia pulcherrima* is not uncommon in Europe. Growers there usually control the disease by regulation of the air, moisture and light conditions. If further treatment is necessary they apply some copper spray, as it is well known that sulphur is ordinarily not very effective against *Botrytis*.

A short time after the Euphorbia stem-rot was noticed, several small plants of *Stapelia gigantea* in the same house showed a similar stem rot. No isolations were made from the Stapelia, however, but plants were inoculated with the fungus originally obtained from the Euphorbia. A similar rot followed (FIGURE 1). The results of these inoculation experiments must be checked by further work. Further work on the rots of both the Euphorbia and the Stapelia is being done to determine the specific identity of the *Coniothyrium* and also the host range of the causal organism. This report will be made at another time.

B. O. DODGE.

SUMMER MEETINGS OF SCIENTISTS

Staff members of The New York Botanical Garden last month attended several sessions of scientific organizations. Brief reports of them are given here.

Botanical Society of America in Connecticut

The first of the two summer meetings of the Botanical Society of America, which took place at New London, Conn., June 17-19, was attended by Dr. H. A. Gleason, vice-president, and by Dr. and Mrs. A. C. Smith and Mr. E. J. Alexander, also from The New York Botanical Garden, as well as by Dr. Edmund W. Sinnott, of the Garden's Board of Managers. Others from the New York area who were present included Dr. F. E. Denny of the Boyce Thompson Institute, Dr. H. K. Svenson and Miss Hester M. Rusk of the Brooklyn Botanic Garden, and Drs. John W. Shive and M. A. Johnson of Rutgers University. The total attendance was forty-eight.

After the formal program, which consisted of a paper on "Research progress and opportunities in the New England marine algae" by Professor William Randolph Taylor and one on "The migration of the coastal plain flora into southern New England" by Professor Merritt Lyndon Fernald, the time was spent largely in excursions and collecting trips. Marine algae and shore vegetation were sought on the shore of Long Island across Long Island Sound and inland terrestrial plants on a trip to Lantern Hill at North Stonington and to Devil's Hopyard at Lyme, Conn. At Ledyard, the party visited the farm of the late Dr. Graves, where they saw the Larrabee oak, known as the largest oak in Connecticut. Standing about 70 feet high, with a spread of 120 feet, this tree (*Quercus alba*) has been estimated by residents to be 350 years old, but the botanists who saw it declared its age could scarcely be less than 700 years.

Rochester-Ithaca Meeting of the A.A.A.S.

Dr. Fred J. Seaver recently attended, as an unofficial delegate from The New York Botanical Garden, the summer meeting of the American Association for the Advancement of Science, held in Rochester and in Ithaca, N. Y., the latter in conjunction with the semi-centennial celebration of the founding of Sigma Xi. Dr. Seaver was a member of the Council of the A.A.A.S. repre-

senting the Mycological Society of America. The meeting of the Council was held in Rochester.

Most of the formal meetings were held in the buildings of the University of Rochester, located on the beautiful River Campus in the suburbs of the city. Two of the outstanding features of this meeting were the excursions through the plants of the Eastman Kodak Company and their research laboratories, and those of the Bausch and Lomb Optical Company.

At a complimentary luncheon tendered the Association by the latter company, the 250,000th microscope made by Bausch & Lomb was presented to Dr. F. G. Novy in recognition of his accomplishments in research.

At the Ithaca celebration of the Society of Sigma Xi, a beautiful monument, erected in front of the building in which the organization had its birth, was unveiled with appropriate ceremony.

Sigma Xi was organized at Cornell University in 1886 by a group of nine men who realized that there should be a scholastic fraternity to which scientifically-minded students, not eligible to the classical scholastic fraternity, might be admitted. Three of the nine original founders of this well-known organization attended the semi-centennial celebration. The principal address at the first meeting in Ithaca was on "The Service of Sigma Xi in the Universities of the Future" by Dr. Karl T. Compton, President of the Massachusetts Institute of Technology.

On the evening of June 19 a buffet dinner was served in Willard Straight Hall by the local chapter of Sigma Xi for the visiting delegates and their friends. Two hundred were expected at this dinner, but seven hundred were served. An address was given by Dr. Max Mason, President of the Rockefeller Foundation, on "Science and the Rational Animal."

A GLANCE AT CURRENT LITERATURE*

Among the "Forgotten Favourites" of which J. Coutts of Kew writes in the *New Flora and Silva* for April are a number of American plants which have been seldom if ever used horticulturally in this country, though they were known long ago as

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* All of the publications mentioned here—and many others—may be found in the Library of The New York Botanical Garden, in the Museum Building.

desirable garden subjects in England. He mentions especially *Rhexia virginica, Spigelia marilandica, Jeffersonia diphylla,* and *Vancouveria hexandra,* and suggests our native bloodroot, *Sanguinaria canadensis,* for naturalizing. He also urges the more extensive use of *Dodecatheon, Muscari,* and *Erythronium,* as well as *Chionodoxa Luciliae* for naturalizing, and recalls the pleasing effect of the dame's violet, *Hesperis matronalis,* in gardens of former years.

* * *

Plant subjects treated in the *Gardeners' Chronicle of America* for June include *Dianthus, Phlox, Digitalis, Campanula* (annual species), and native American alpines with emphasis on species of *Pentstemon.*

* * *

The sixth volume of *Lexington Leaflets,* published by Stephen F. Hamblin at Lexington, Mass., begins with western American alpines for early bloom in the garden, and tells also where the plants mentioned may be obtained.

* * *

"Just About Lilacs" is the subject of the Arnold Arboretum's *Bulletin of Popular Information* for May 20. Selection of good varieties, culture of the plants, how to combat diseases and insect pests, and an important section headed "Lilacs that do not bloom" are included in this brief treatment of the subject.

* * *

Andean travelers this summer are offered a voluntary commission to help in bringing some handsome new plants into cultivation. The showy-flowered genus *Bomarea* of the Amaryllis Family is treated by E. P. Killip in the April *National Horticultural Magazine.* Only a few species are in cultivation, the author says, and he therefore expresses the hope that travelers to its native haunts in the Andes will bring back seeds or young plants that may be established in North American gardens.

* * *

Dr. A. B. Stout's "Seedlessness in Grapes" has appeared as *Technical Bulletin 238* of the New York Agricultural Experiment Station at Ithaca, N. Y. It contains 68 pages and is thoroughly illustrated, including the colored plate of the Bronx seedless grape which appeared also in this JOURNAL in April.

The history of botanical nomenclature is dealt with in the first of a series of articles entitled "Problems in Classification of Plants" appearing in the February *Journal of the Royal Horticultural Society* under the authorship of Professor Sir William Wright Smith, Director of the Royal Botanic Garden at Edinburgh.

The same issue contains the lists of plants which were granted awards by the Royal Horticultural Society during 1935.

* * *

Continued research on the use of artificial light and reduction of the daylight period for flowering plants in the greenhouse has been carried on by G. H. Poesch and Alex Laurie. The latest results are published as Bulletin 559 of the Ohio Agricultural Experiment Station.

* * *

An index of American palms has just been issued by the Field Museum of Natural History, designated as Publication 355. Compiled by B. E. Dahlgren, it includes a 280-page list of genera and species, 80 pages of vernacular names, a geographical list with synonymy, acknowledgment of literature on the subject, and a section on fossil palms by A. C. Noé.

* * *

Experiments with seedling growth in partially sterilized soil, conducted at the John Innes Horticultural Institute at Merton, England, are reviewed in the *Gardeners' Chronicle* for April 18. The addition of phosphate, it is shown, has proved a remarkable stimulation to the growth of the seedlings, and in many cases germination was also favorably affected.

* * *

A report of a cactus-collecting expedition in Argentina and southern Bolivia is given by Harry Blossfeld in the April *Cactus and Succulent Journal*. Five thousand kilometers had already been covered by the explorers, who were planning a further foray into Uruguay.

* * *

Fangs which emit the poison from the leaves of poison ivy are pictured under the microscope in an article by Nathan C. Johnson in *Nature Magazine* for May. The author, who has done extensive research on poison ivy, found the poison also

transmittable through pores in the stem and from the epidermis of the roots. He found the roots highly poisonous even in winter-time.

CAROL H. WOODWARD.

NOTES, NEWS, AND COMMENT

Dr. Harry Warmke, head of the department of biology at Seton Hall College in New Jersey, is working this summer with Dr. B. O. Dodge on cultures of fungi.

* * *

Two scholarship students at The New York Botanical Garden this summer are W. Lawrence White, a graduate student at Cornell, who is spending a month doing mycological research under the direction of Dr. F. J. Seaver, and John R. Shuman, research assistant in genetics at the University of Wisconsin, who is working for a month with Dr. A. B. Stout on problems of breeding in *Hemerocallis*. Hoyt Fowler, a student in botany at Columbia University, is a volunteer worker in plant breeding at the Garden this summer.

* * *

Dr. E. H. Graham of the Carnegie Museum in Pittsburgh came to the Garden in June to work on a collection of plants he had made in the Uinta Basin in Utah and Colorado.

* * *

Dr. Mildred E. Mathias spent a week at the Garden recently, working on collections of Mexican Umbelliferae received from Berlin-Dahlem, Kew, and the Bohemian National Botanic Garden in Prague.

* * *

Professor H. H. Whetzel of Cornell University recently spent two days at the Garden, in connection with his work on parasitic fungi. Professor Whetzel is working on some specimens of fungi from South America, the hosts of which are being determined at The New York Botanical Garden.

* * *

Dr. Anna E. Jenkins of the United States Department of Agriculture, Washington, D. C., visited the Garden in June on her return from a nine months' stay in Brazil, where she was sent by

the Department of Agriculture to study certain species of parasitic fungi on citrous fruits.

* * *

The following visiting botanists have registered in the library during the spring: Dr. E. D. Merrill, Cambridge, Mass.; Dr. M. L. Lohman and Mr. Theodore T. Ayres, New Haven, Conn.; Dr. Clement G. Bowers, Maine, N. Y.; Miss Julia R. Lawrence, Poughkeepsie, N. Y.; Mr. Roger McVaugh, Kinderhook, N. Y.; Prof. H. M. Fitzpatrick, Mr. W. Lawrence White, Miss Marion L. Dawson and Mr. M. C. Richards, Ithaca, N. Y.; Mr. V. K. Chesnut, Hyattsville, Md.; Dr. William C. Steere and Dr. Alexander H. Smith, Ann Arbor, Mich.; Dr. A. J. Grout, Manatee, Fla.; Mr. Robert P. St. John, Floral City, Fla.; Prof. Harold St. John, Honolulu, Hawaii; Captain F. Kingdon Ward, England; Dr. E. Kol, Szeged, Hungary, and Mr. Charles E. Foweraker, Christchurch, New Zealand.

* * *

Waterlilies promise to be one of the Garden's outstanding displays during the entire summer. A collection of unusually fine plants of about forty hardy species and varieties has been in bloom since early June. This month the tender waterlilies which occupy the more westerly pool in the court outside of Conservatory Range No. 1 will come into flower to remain until late fall. Meanwhile, several species of *Nelumbium* (of which one has long been erroneously known as the lotus of Egypt, instead of East India) will be blooming at the end of the pool which harbors the hardy waterlilies. Inside the conservatory, a specimen of *Victoria regia*, the royal waterlily of the Amazon, is making rapid growth.

* * *

Roses in June this year gave one of the finest displays ever seen at The New York Botanical Garden, a display which was the reward of excellent culture and winter care, of thorough spraying and dusting to keep away insect pests and diseases, and of the selection of many fine varieties. The firm of Bobbink & Atkins of Rutherford, N. J., presented the Garden with 3,000 new plants last spring. While many of the roses will continue to bloom all summer, a second display comparable to the flowers of June is expected in the autumn.

REVIEWS OF RECENT BOOKS

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

Clematis for Everyone

To read of whole gardens of clematis, in which different forms of this plant are used among rocks, in the border, on trellises, arbors, climbing trees or rambling over bushes, trained on diagonal branches to create a whole bed of bloom, and sometimes employed as a long-lasting cut-flower, makes the gardener realize how much he has been missing by not having a wide selection of clematis in many types of plantings. Ernest Markham, Great Britain's greatest living authority on these plants, has done an inspiring piece of work in his book, called "Clematis," which has been made eminently practical for the United States through a chapter entitled "Clematis in America" written by J. E. Spingarn, this country's acknowledged authority.

Besides descriptions of 80 natural species and varieties and of more than 150 garden varieties and hybrids, the author gives clear instructions on how to plant, propagate, keep free from disease and otherwise care for the different types of clematis.

"In my opinion," he says, "the pruning of Clematis is of far greater importance than many writers would have us believe . . so I have made a point of giving especial attention to this phase of cultivation."

Col. Spingarn names many species which are hardy in northeastern United States, and mentions especially those which are most suitable for the beginner.

* * *

Gentians By the Hundred

Gardeners possessed of the collective instinct will cherish David Wilkie's new book, "Gentians." As the first complete survey of the genus *Gentiana*, this book reveals undreamed-of horticultural possibilities in this enormous group of plants, whose species range in form from the vivid blue flowers on plants no higher than one joint of a finger, such as in *G. ornata*, through the familiar fringed and bottle gentians of North America, to the man-high *Gentiana lutea* of southern European mountains.

In 187 pages, Mr. Wilkie, who is on the staff of the Royal Botanic Garden in Edinburgh, gives a compact but complete view of this genus—botanically, horticulturally, and in fair measure

photographically. Nearly 100 species are illustrated—in some cases, where confusion among them is likely, by series of photographs which may be compared.

Besides thorough descriptions of 104 species known in cultivation, concluding each one with directions for propagation, the author appends tabulated notes on more than 600 other species and varieties.

A tantalizing survey, this—one which gives gardener and plant collector a gnawing desire to acquire and cultivate gentians by the hundred.

* * *

Lilies in the Garden

One wonders if scholarly works on gardening may some day come more abundantly out of America after all the beginning gardeners have been taught their primary lessons. Can there possibly be enough beginners arising annually to keep the flood of books for them continuing forever? One of the latest is about lilies, by Mr. Quint.[1] Aimed, as it is, at the novice, it gives clear enough directions for growing lilies of different sorts in different situations. But it scarcely takes account at all of lily mosaic disease, which has caused the failure of so many splendid gardens in recent years. To the lily grower who has once suffered its ravages, it is the most important problem which he has to face, and, without knowledge of how this disease behaves, it also is the most puzzling problem of all. Other diseases and pests are also all but neglected. It is pleasantly optimistic to say blithely, "Let's grow lilies!" But the gardener of long experience knows there is more than just putting the bulb in the ground at the proper depth and following a list of simple cultural rules. The beginner may even have difficulty in following Mr. Quint's directions, for several stem-rooting types, such as the well-known *L. canadense, L. Martagon,* and *L. superbum,* are listed as bulb-rooting species.

* * *

How to Raise Gourds

Miss Helen M. Tillinghast, whose gourds have been exhibited in the Museum Building for two successive autumn seasons, has written and published the "First Gourd Book,"[2] a primer of gourd cultivation. In addition to growing, she treats of the botany, history, and artistry of gourds, and includes a brief section on breeding to obtain new forms.

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[1] Quint, I. George, Lilies in the Garden. 96 pages, illustrated. Doubleday, Doran, Garden City, N. Y. 1936. $1.

[2] Tillinghast, Helen M., First Gourd Book. 33 pages, illustrated. Published by the author at Vernon, Conn., 1936. $.50.

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ROCKY MOUNTAIN EXPEDITION

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TOXIC WIND-BORNE POLLEN IN ITS RELATION TO HAYFEVER

All true hayfever is caused by irritating pollen being blown into the eyes or being breathed by people who are unusually susceptible to it. Consequently, hayfever follows the cycle of the seasons, coinciding in time with the flowering of plants which produce the kinds of pollen to which human beings are sensitive. In northeastern United States hayfever occurs in three fairly well-defined seasons, early spring, late spring or early summer, and late summer.

Early spring hayfever is due to the early-flowering trees which take advantage of their leafless condition to scatter their wind-borne pollen. It may begin very early, in March or April, almost as soon as the last frost disappears, when the elms, silver maples, and pussy willows flower. These are followed by the poplars, birches, other species of willow and maple, and the box-elder, which prolong the season well into May. These early-flowering trees are notorious for the enormous quantities of pollen they produce; the oaks, for example, far outranking all other plants when at the height of their flowering season, and the birches following them a close second. Yet the pollen from these trees claims relatively few hayfever victims, and the affliction, though it may be very severe, is usually of short duration. This is because the trees involved belong to widely separated families, while hayfever sensitization is more or less specific; if a person is sensitive to one kind of pollen he is not necessarily sensitive to any of the others, except those which are closely related. Thus an elm-sensitive person will suffer only during the flowering of the various species of elm, which does not last much more than two weeks in April, and an oak-sensitive person will suffer only during the flowering of the oaks, for about two weeks in May.

Although the flowering of the numerous species of trees like the willows and maples may last from March until well into May, they each produce so little pollen that it is seldom abundant enough to do much harm. So, on the whole, tree hayfever is relatively unimportant in the northeastern states.

Before the early-spring hayfever is over the early-summer type begins. This is due almost entirely to the grasses, and is very much more severe than that of the preceding season, because the grasses are all so closely related that it matters little which kind of grass pollen is in the air. That is, if a person is sensitive to one kind he is likely to be, or soon to become, sensitive to any other to which he is exposed, the main difference between the species of grass being almost entirely a matter of their abundance or the amount of pollen that they shed. This hayfever season begins toward the end of April or the beginning of May with the flowering of sweet vernal grass. This is a low and rather inconspicuous grass, but widely distributed and producing enormous quantities of pollen. Before its flowering period is over June grass and orchard grass come into bloom, toward the end of May or the beginning of June. Both of these are extensively cultivated for their high agricultural value, and are intimate human associates, for they are not alone country dwellers; they take so readily to city and suburban life that it is difficult for a hayfever sufferer ever to be very far away from them. These two grasses are followed closely by timothy and redtop, which come into bloom toward the end of June. Timothy is a country grass and not so aggressive an invader of city and suburban lots as the preceding, but it is extremely abundant in most farming districts for it is the standard hay grass throughout the cooler sections of the United States. Redtop is often associated with timothy but is most abundant in moist meadows, its reddish panicles coloring vast stretches of country in midsummer. Both of these grasses complete their flowering about the middle of July, after which the hayfever victim may have several weeks of relief before the third or late-summer period begins.

These five grasses are the most important in the northeastern states from the hayfever standpoint, and probably account for nearly all of the early-summer hayfever. Of the numerous other grasses, however, a few must be counted as of secondary importance. Among these are the fescue grasses, especially red and

meadow fescue, rye grass and darnel. All are prolific pollen shedders but are seldom abundant enough to be very important. Another is quack grass but this, while abundant, does not shed enough pollen to rank very high as a cause of hayfever. It is likely that without the five grasses, sweet vernal, June, orchard, redtop and timothy, the problem of the early-summer hayfever in the northeastern states would be relatively unimportant.

In the middle of August begins the third and by far the worst hayfever period. It is due entirely to the tall and short ragweeds and their close relatives, the cockleburs. The tall ragweed begins to flower during the first week in August, the short several days later, and almost immediately thereafter their pollen may be detected in the air by appropriate means, but it does not reach

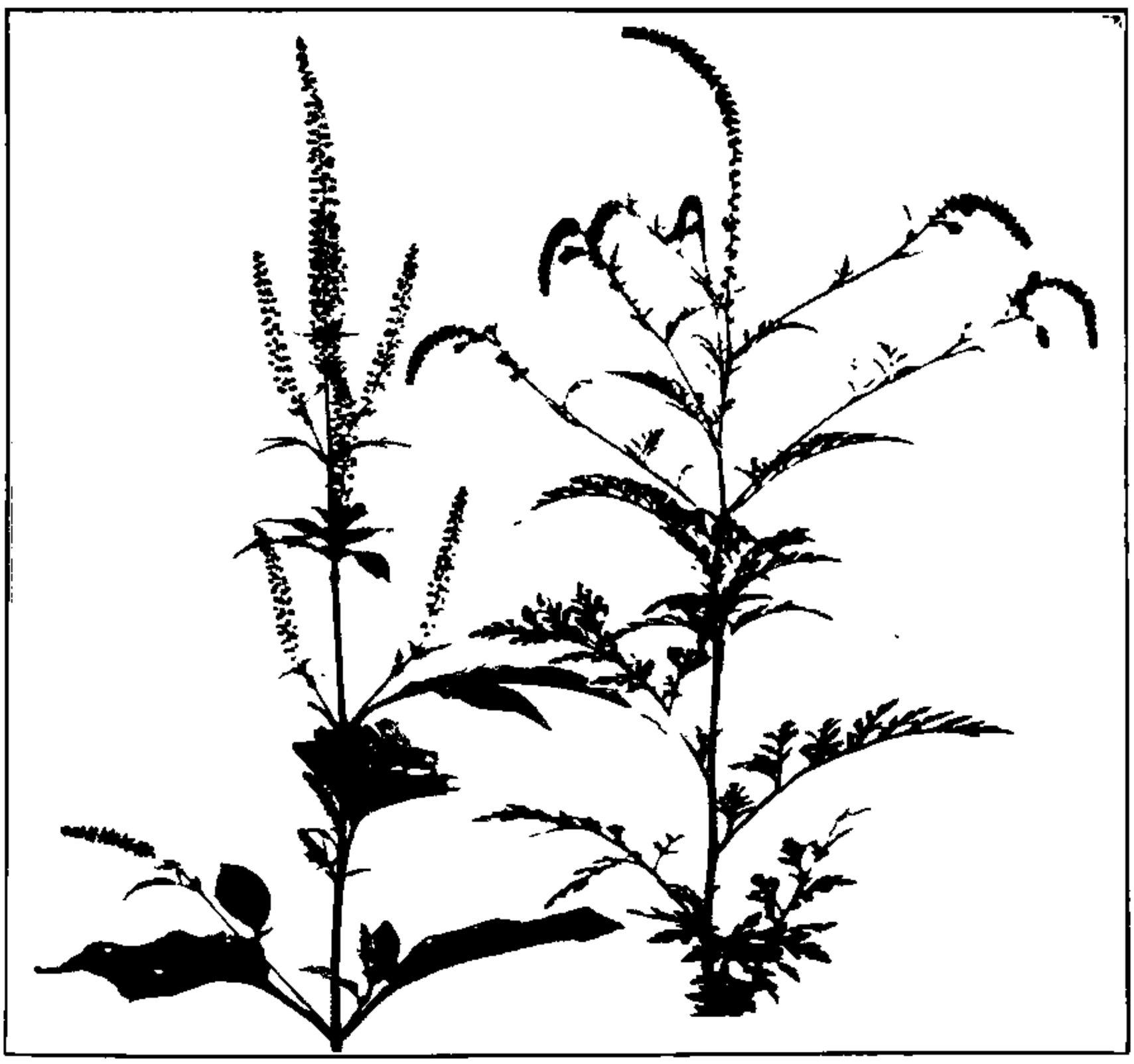


FIGURE 1. Two ragweeds which cause the majority of late-summer cases of hayfever in northeastern United States. At the left, the tall ragweed, *Ambrosia trifida*, one fourth natural size; right, the short ragweed, *A. elatior*, one third natural size. Complete destruction of these two plants, of which only the upper portions are shown here, would bring relief to thousands of people every year.

sufficient concentration to bring on symptoms of hayfever until about August 20. The ragweeds and their allies are short-day flowers; that is to say, it is the shortening of the hours of daylight as the season advances that finally brings them into flower. As a consequence the late-summer hayfever season arrives each summer on exactly the same day in any given locality, and comes several days earlier to the north, and several days later to the south. This is exactly the opposite from the tree- and grass-hayfever seasons, which always are subject to weather variations and begin much earlier in the south than in the north.

As the season advances and more of the ragweed plants come into flower, the load of pollen in the air builds up until it can be reckoned in tons, reaching its maximum early in September, after which it gradually declines as the plants die out or go to seed. Before there has been much diminution the cockleburs offer their contribution, but this is very much less than that of the ragweeds, and the season gradually comes to a close at about the end of September or early in October.

Taken throughout the country, many more plants are involved in hayfever than those mentioned above. Yet of the several thousands of our native and introduced plants, only a small proportion, at the most one or two hundred, can be regarded as real hayfever plants. This is because in order to cause hayfever, plants must possess a number of characters which, while they occur often enough individually, occur in combination relatively infrequently. They must be wind-pollinated and produce large amounts of pollen of a buoyant character capable of being widely distributed in the air; they must be abundant and widely distributed; their pollen must be toxic. Plants possessing all of these characters belong to only a few families, almost without exception among the angiosperms.

An outstanding family is that of the grasses. The pollen of all appears to be toxic to a high degree. They are all wind-pollinated and the pollen grains of most are well within the size range best adapted to wind dispersal, but the majority of them fall short in some other respect. Most of the grasses rarely grow in sufficient abundance, while many others, like barnyard grass and yellow foxtail, which are quite abundant enough, shed too little pollen. Indian corn is unique among the grasses in having non-buoyant pollen; its grains are nearly 100 microns in diameter, consequently

FIGURE 2. Tip of a flowering branch of *Ambrosia elatior*, whose insignificant-looking green flowers produce enormous quantities of toxic pollen.

they are too heavy for wind dispersal, and, though they are shed in enormous quantities and are of proved toxicity, they do not ordinarily cause hayfever to susceptible persons unless they come into close contact with the flowering plants.

The pollen of the Composite Family possesses the toxicity to a degree equal to or greater than that of the grasses. Besides the tall and short ragweeds and cockleburs already mentioned, the closely related western ragweed and western giant ragweed are almost as important as the two eastern species, in states where they are abundant. In fact, all of the members of the Ragweed Tribe are potential hayfever plants for all are wind-pollinated, all shed large amounts of buoyant pollen excellently adapted to wind dispersal, and, while there is some variation in pollen among the different species, all seem to possess toxicity to a high degree.

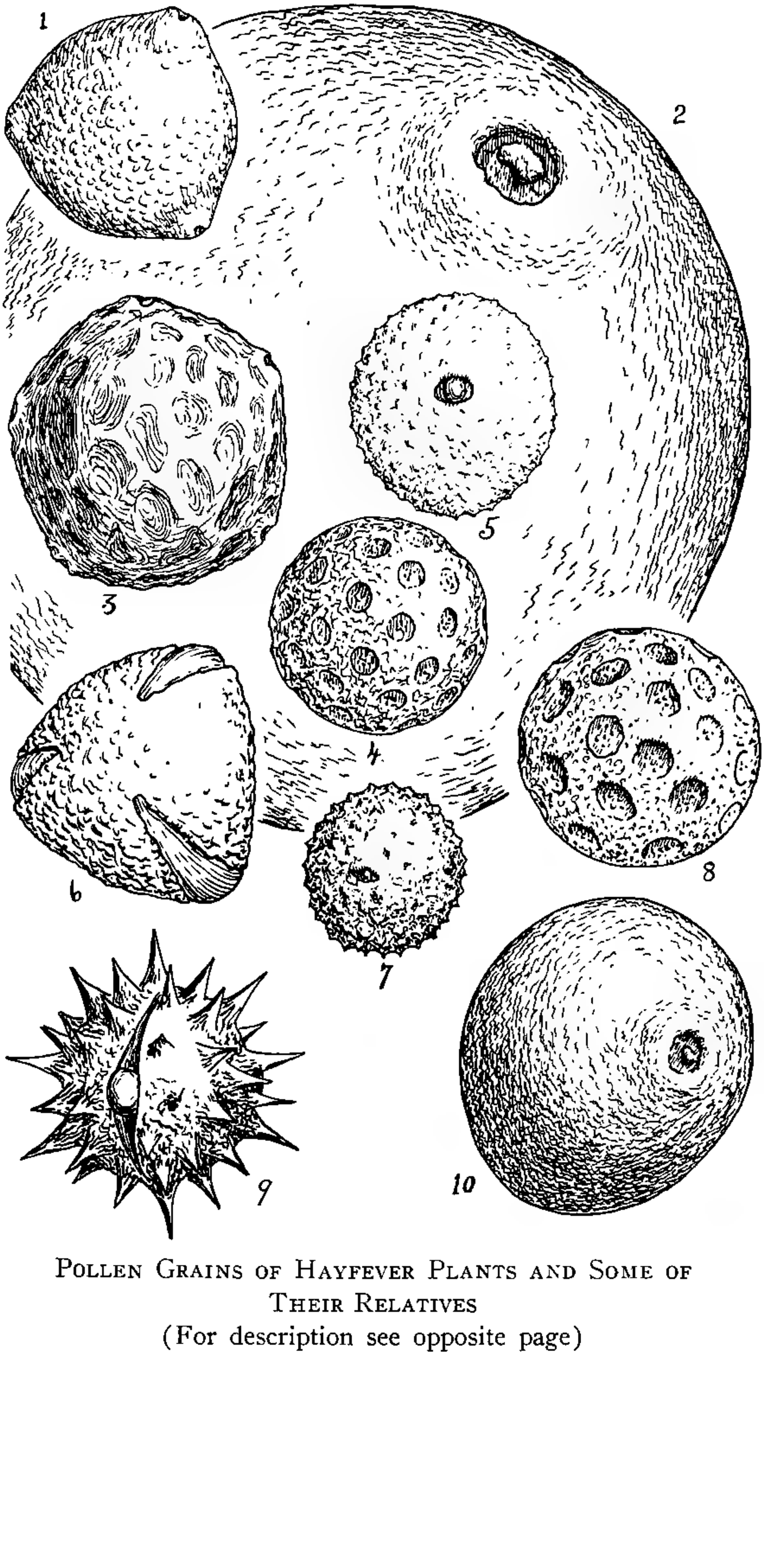
Those which do not cause hayfever are prevented from doing so solely by lack of abundance or limitations of distribution.

Phylogenetically, the Ragweed Tribe is a group of wind-pollinated derivatives from the Sunflower Tribe, so, as would be expected, the pollen of sunflowers is found by experiment to affect ragweed-hayfever patients in exactly the same way as the pollen of ragweeds themselves, but, in the ordinary course of events it is prevented from causing hayfever because sunflowers are entomophilous; that is, they are insect-pollinated, and their pollen is not in the least adapted to wind dispersal.

Another related group of plants is that of the sagebrushes, mugworts and wormwoods, the genus *Artemisia*. These are all wind-pollinated, the pollen of all is toxic, and they count among their members such notable hayfever plants as the common sagebrush, prairie sage, California mugwort, field sagewort, and many others. It is fortunate that outside of these two groups few other Compositae are wind-pollinated, for all seem to possess hayfever toxicity to a high degree. For example, goldenrod pollen, which has frequently been blamed as a cause of hayfever, can be made to elicit the typical hayfever response from late-summer hayfever patients, but it is ordinarily prevented from doing so because it is entomophilous and not borne by the wind.

Other families whose members contribute to hayfever, though generally to a lesser degree, are the Chenopod and Amaranth Families, with such notable examples as the Russian thistle and western water-hemp, both troublesome hayfever weeds in the midwestern states. The Plantain Family has a single but rather troublesome representative in this category, English plantain, which claims a considerable number of hayfever victims in the eastern states. Such other members of the family as Rugel's plantain and common plantain, though almost as common, shed so little pollen that they are of no consequence.

FIGURE 3. Pollen grains of hayfever plants and some of their relatives, drawn to scale by the author and magnified 1,150 diameters. No. 1, pollen grain of white birch, found in great quantities in the air in spring; 2, the large pollen grain of corn, which is toxic but is too heavy to float through the air; 3, elm, one of the earliest hayfever pollens to appear in the spring; 4, western water-hemp, troublesome in the midwest; 5, cocklebur, whose late-summer pollen overlaps that of the ragweeds; 6, the oak pollen, most prolific among the trees; 7, short ragweed, one of the worst hayfever pests of all; 8, Russian thistle, a bad hayfever weed of the prairie states; 9, sunflower pollen, which is toxic but borne by insects, therefore of minor importance in causing irritation; 10, timothy, which sheds abundant toxic pollen in June, especially in farming sections.



POLLEN GRAINS OF HAYFEVER PLANTS AND SOME OF THEIR RELATIVES

(For description see opposite page)

By no means do all wind-pollinated plants cause hayfever. The pollen of the cattails and of the pines, firs, and spruces, for example, possess all the physical characters of hayfever pollen, but I believe no authentic cases of hayfever from any of them have ever been recorded. Their pollen appears to be non-toxic.

If one wishes to discover which kinds of pollen are in the air at any time and likely to be causing hayfever, one can expose a slide with a small spot lightly coated with glycerine jelly to which has been added an appropriate dye such as basic fuchsin or methyl green. If after 24 hours the slide is brought in, gently heated, and a cover-glass placed on it, the pollen grains will be found beautifully stained and in a medium suitable for their examination. For their identification one should have a reference collection, mounted in the same medium, of the pollen, of all the anemophilous, or wind-pollinated, plants of the vicinity. As many as possible of the commoner insect-pollinated species should be included too, for some of these will occasionally be found on the slides, though never in such abundance as the others.

The pollen which may be caught in this way is of many different forms, often extremely beautiful but, while the entomophilous pollen grains may be ornate and highly distinctive in character, the anemophilous pollen grains are generally quite plain and lacking in sculptured patterns. Those of the grasses are always smooth, thin-walled and globular, and provided with a single small germ pore. Those of English plantain are similar but provided with 7 to 14 pores. Those of the mugworts and sagebrushes are globular and nearly smooth, but thick-walled and provided with three meridionally arranged furrows which open and close as the grains expand and contract with changes in moisture content. Those of the ragweeds are globular and thick-walled but not smooth. Instead they are covered with many low conical protuberances, almost spine-like. At first sight these do not look like anemophilous grains, but if we compare with them the pollen grains of the related but entomophilous sunflower we find that in place of low conical protuberances are long dagger-like spines. It is almost an unalterable rule that anemophily leads to reduction of pollen sculpturing.

In making pollen surveys stations are set up in different localities and atmospheric pollen slides are exposed every day. The counts of the various species are recorded as they are caught.

Then at the end of the summer a chart may be drawn showing when each kind of hayfever pollen first appears in the air, when it reaches its height, and when it dies out. Such information is of great value both to the victim of hayfever and to his physician. A few such pollen records have been made and are available in the various medical journals and books on hayfever, but many more remain to be done. The field is an attractive one and the results are sure to be useful.

On the basis of such studies the local physician provides himself with pollen extracts of all of the hayfever plants of his locality. With these he can determine, by means of a simple cutaneous test, to which plants any hayfever patient is sensitive. Then, if the patient presents himself for treatment ahead of the season, the physician is enabled to build up his tolerance in advance by injecting subcutaneously small but gradually increasing doses of the appropriate pollen extracts. The rule is to use extracts of only the one or several kinds of pollen to which the patient is sensitive and to which he is likely to be heavily exposed, always keeping the number as small as possible and never combining those of different biological groups. Thus if a patient in the northeastern states is found by skin test to be sensitive to the pollen of the ragweeds, cocklebur, sunflower, goldenrod, and sagebrush, he is treated with a combination of only the two ragweeds, with or without that of cocklebur according to his exposure to its pollen, for cocklebur is of only local distribution in the northeastern states. Sunflower and goldenrod are omitted entirely because they are insect-pollinated and easily avoided if the patient knows he is sensitive to them. Sagebrush is omitted because it is entirely western and no species of its genus grow in sufficient abundance in the northeastern states to be of any real importance in hayfever. Or, if the patient is found to be susceptible to the 15 or 20 species of grass pollen with which he may have been tested, he is treated with a combination extract of only the four or five principal grasses to which he is exposed. The success of the treatment depends upon injecting as much as possible of the most important pollen, without overstepping the patient's limits of tolerance.

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Yonkers, N. Y.

THE SOUTHERN TRIP OF THE TORREY BOTANICAL CLUB

Two weeks which were spent in the southern Appalachians between June 5 and June 21 of this year gave to members of the Torrey Botanical Club an unforgettable view of this scenic region at a time when the plants in which the party was interested were at their best. The field trips of the club are always deserving of recognition, and this was the outstanding excursion of the current year.

Four peaks in the Blue Ridge of Virginia and North Carolina and one peak farther southwest were the main objectives of the trip, which, originally designed by Mr. E. J. Alexander of The New York Botanical Garden, who at the last moment was unfortunately unable to go, was guided by Mrs. Gladys P. Anderson, lichen authority. Hawksbill in the Shenandoah National Park was visited; the Peaks of Otter farther south; Whitetop on the Virginia-North Carolina state boundary, and Grandfather Mountain in western North Carolina. The climax came with a trip to Roan Mountain, in an outlying part of the Great Smokies.

The first few days were spent in searching for shale-barren plants in north-central Maryland and at the northern end of the Shenandoah National Forest in Virginia. *Draba ramosissima,* typical of such sites, was a noteworthy species found. Other conspicuous plants, though not limited to the barrens, included goat's rue or cat-gut, *Cracca virginiana*, and *Penstemon canescens*. Especially rewarding of our efforts was a fine stand of *Cypripedium spectabile* in the rich moist bottom of a large kettle-hole at the northern end of the National Forest, as well as a prolific clump of shooting-star, *Dodecatheon*.

The Skyline Drive along the crest of the Shenandoah National Park undoubtedly is one of the finest for mountain scenery in the eastern United States. On Hawksbill, the highest peak in the park, we saw red spruce, Fraser's fir and, presumably, *Pinus pungens*; the latter was definitely seen on the nearby peak of Skylands as well as in the forest just south of Front Royal. *Gillenia* was blooming everywhere; other genera of shrubby and herbaceous plants, to mention only a few, included *Adlumia, Corydalis, Aquilegia, Houstonia, Aruncus, Veratrum, Heuchera,* and *Lyonia*. One especially beautiful flower whose brilliant red

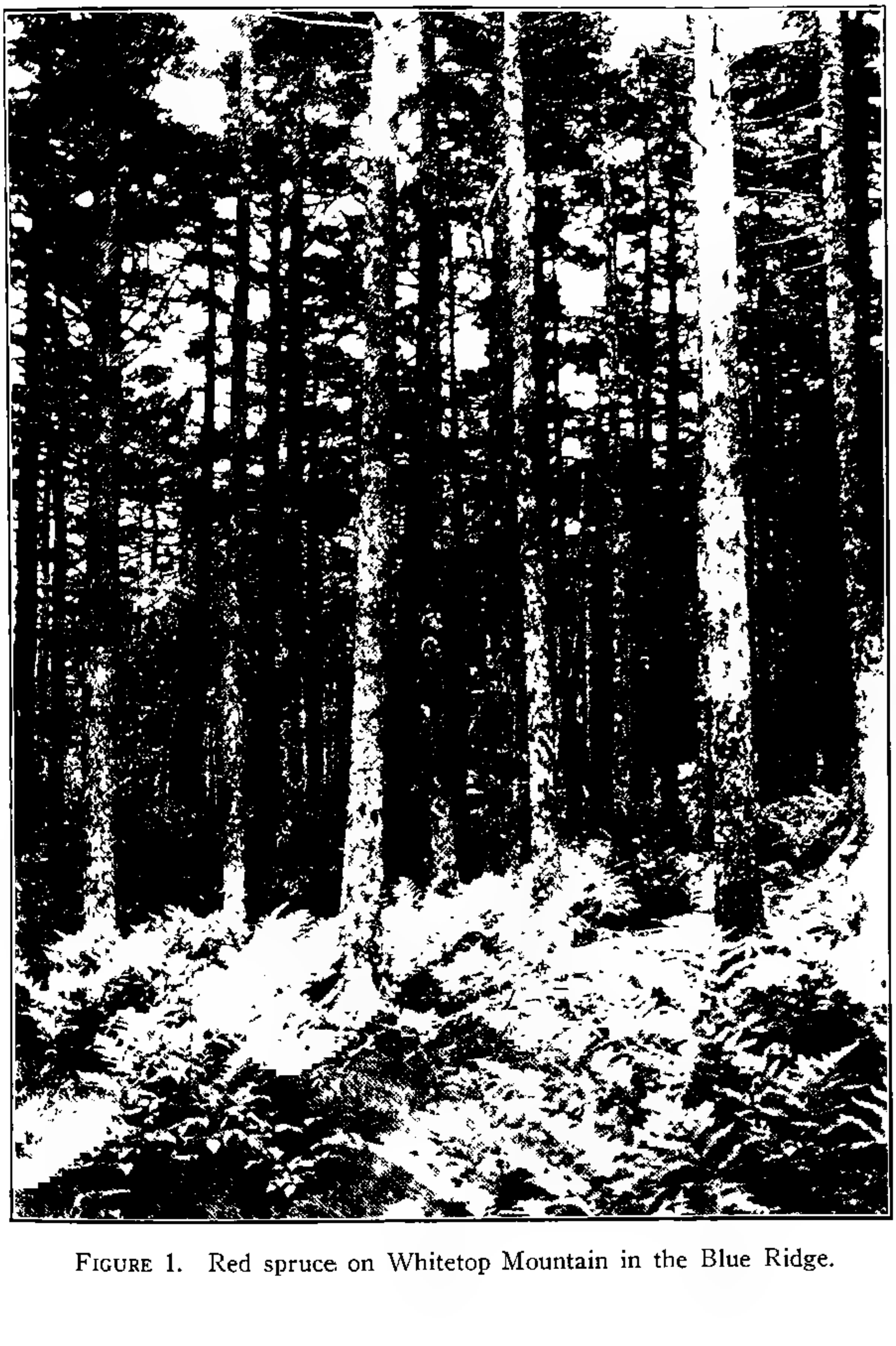

FIGURE 1. Red spruce on Whitetop Mountain in the Blue Ridge.

we were to see frequently during our stay in the mountains was the fire-pink, *Silene virginica,* recently illustrated in *Addisonia.*

Mention at least must be made of the venerable specimens of arborvitae at the Natural Bridge which Dr. Chester Reed claims to be 1,200 years old. They are indeed hoary specimens and to attribute such an age to them seems no exaggeration.

One of the Peaks of Otter, Sharp-top, was the next objective. A new winding road, as yet unpaved, leads from Buchanan for 12 miles to the Hotel Mons high in the mountain and near the foot of the peak. A tortuous and rocky road and a final quarter-mile climb by foot leads one to a distinct and rock-laden peak overlooking the valley. *Dicentra eximia* was the most attractive flowering plant at the time, rivaled only by the already mentioned fire-pink. Mountain laurel and *Rhododendron maximum,* too, were conspicuous and among smaller plants were *Aconitum, Ceanothus, Clintonia,* and *Galax.*

Whitetop, 5,678 feet high and almost on the North Carolina line, can be ascended nearly to the top by auto. It is not a rugged challenging type of mountain, like the Peaks of Otter. Instead on the very top is a dense and beautiful stand of red spruce, which covers, besides the summit itself, an area probably half a square mile in extent. Around and below this stand are open, meadow-like, grass-covered slopes known as balds, hundreds of yards in width. The spruce forests and the balds do not merge into one another but adjoin very abruptly, scarcely any of the natural reproduction of the forest encroaching upon the balds.

Large plants of *Veratrum viride,* which is more often associated with low swamp lands, were noticed in the upper parts of this bald. The intense blue of *Houstonia serpyllifolia,* flowering in great abandon at the time, was striking, while *Potentilla tridentata* and scattered specimens of *Menziesia pilosa,* an ericaceous shrub, seemed to complete the flowering fringe of conspicuous angiosperms.

Within the stand of spruce were handsome patches of *Oxalis* and elsewhere on the mountain our attention was attracted, among many other plants, by *Gaultheria, Lycopodium, Saxifraga, Lythrum, Sorbus,* and *Sambucus.*

During a three-day sojourn at Linville, N. C., we met with members of the Sullivant Moss Society and made acquaintances in a manner which only an open hearth on a chilly evening in the

mountains can promote. The "Gardens of the Blue Ridge" which were nearby well repaid a visit, for in this nursery Mr. E. C. Robbins assembles and propagates a large selection of plants from the native flora. Outstanding at the time of our visit was a handsome clump of *Cypripedium spectabile* in full flower.

Linville Gorge held our attention for a morning not only because of its rhododendron-flanked sides but even more by its virgin stand of hemlock, both the northern and the southern species, *Tsuga canadensis* and *T. caroliniana.* The former becomes the larger in both height and thickness and unusually handsome specimens with trunks three feet in diameter may be seen here. Carolina hemlock well deserves its reputation of being one of our handsomest native conifers. Its foliage is not so formal and stiff as that of the northern hemlock because the leaves are longer and rotately distributed, not distichous. Long broad-topped and conspicuously deep ridges mark the distinctive bark of mature trees and recall to mind similar features of the chestnut oak, persimmon, and hackberry, though in the last two the ridges are broken up into smaller units by horizontal crevices.

Grandfather Mountain, 5,964 feet elevation, also near Linville, had already provoked much expectation before we undertook its ascent on one of those brilliant clear days which add so much to any undertaking of this nature. A mountain road winds up its side for a mile and a half, and anyone who goes there for the first time and sees rhododendrons as Nature decreed they should grow, is overwhelmed. This display of *R. maximum,* to be sure, was not so magnificent as the one of *R. catawbiense* which we were later to see on Roan Mountain, but to belittle it would indeed be sacrilege. The profusion and denseness of these shrubs make a wall ten feet high rise on either side of the road. Similar profusion obtains in many other parts of the surrounding country, especially along the highway toward Blowing Rock. Here and there it is punctuated by the breath-taking dash of color which only the flame azalea, *Rhododendron calendulaceum,* can give.

The ascent by foot from the end of the road to the three widely separated peaks of the mountain is one which none but a cynic would decry. Vegetation is abundant along the entire trail but pathetically ruined in places by lumbering operations. The right to intelligent utilization of timber is our heritage but to leave in

FIGURE 2. Lake Drummond, in the heart of the Dismal Swamp, where some of the last of the bald cypresses of the region still stand.

its wake the ugly and fire-hazardous slash which so often accompanies these operations, as on Grandfather Mountain, is, to say the least, a blemish on our intelligence.

Galax grew and flowered in thick masses with its handsome evergreen leaves under the shade of other vegetation. *Clintonia borealis* had already flowered and fruited along the lower part of the ascending trail, but a few hundred feet higher these plants were blooming in all their glory. Sand-myrtle, *Leiophyllum buxifolium*, was abundant on open and more exposed sites and *Menziesia pilosa*, too, followed the trail.

The climax of the entire trip was the ascent of Roan Mountain, whose peak towers 6,392 feet above sea level. Roan is located on the North Carolina-Tennessee boundary line in an eastern extension of the Great Smoky Mountains and it is surprising to most persons to learn that within adjacent parts of these two states there are many peaks exceeding 6,000 feet in elevation, hence exceeding Mt. Washington in New Hampshire, long reputed to be the second highest east of the Rockies.

To the disdain of hardy mountaineers and weather-beaten botanists, one can motor to the very peak of Roan and over a considerable extent of its rolling crown. The entire ascent from Bakersville is some 18 miles in length, the first 14 of which give few extensive views. The last four miles from a toll bridge to the top is over a tortuous rocky and narrow road which challenges the stamina of any auto. Up to this point the journey offers little that is distinctive but beyond it one immediately becomes aware of being in a different type of vegetation. No longer is there a tall growth of timber, and distant vistas progressively open before one. An amazingly dense reproductive growth of Fraser's fir, only a few feet tall, borders the road. The opportunity and need for thinning operations among these seedlings are enormous. It is gratifying to note, however, that somewhere in Nature the pathetic condition of the chestnut is offset by a prolificness of other trees. Among these young firs are scattered specimens of red spruce.

A mixed scrubby growth is almost absent and in open patches amid the young firs and spruces the ground was abundantly bedecked with brilliant southern bluets, whose yellow centers so effectively accentuate their cerulean petals.

Though China may boast of the greatest number of rhododendrons, any idea that America does not also have its share is soon dispelled by one's arrival upon the crown of Roan Mountain. For there is a spectacle of natural vegetation to behold, a carpet of *Rhododendron catawbiense*, figuratively millions in number, actually acres in extent. The vigor and dominance of these plants is accentuated by the utter lack of overshadowing forest; they ascend to the very peak of the mountain and through them the road has in places been cut as between walls four to six feet high. Open areas among them are carpeted with grass and the ubiquitous bluets. Flowering time for the rhododendrons was in its initial stages during our visit and it was not difficult to imagine the overpowering display which would be on that mountain top a few weeks later.

Lumbering operations were still apparently in progress in the scattered stands of Fraser's fir which ascend to Lion's Bluff slightly below and about a mile away from the peak itself. The summit, which may be approached by a steep corduroy road, is surmounted by a fire tower and marked by the United States geodetic benchmark.

Approaching the peaks of the Blue Ridge from the north, along the crest of the Appalachians, differences in topography are not especially apparent, but as one descends, not only from the mountain top to the base, but beyond from the general elevation of the Blue Ridge to the Piedmont Plateau, one is impressed with the topographic variety which may exist within fifty miles, and which expresses itself in the constantly changing panorama of plants.

Near the coast of Virginia, toward the end of the trip, the Torrey Club members saw in Lake Drummond some of the few remaining bald cypresses (*Taxodium distichum*) which formerly constituted an imposing characteristic feature of the great Dismal Swamp.

EDMUND H. FULLING.

ROCKY MOUNTAIN EXPEDITION

E. J. Alexander, Assistant Curator, T. H. Everett, Horticulturist, and Stephen G. Cutting, a student gardener, left New York July 10 for a plant-hunting expedition among the higher peaks of the Rockies from Colorado north to the International Boundary. Mr. Everett will return at the end of his customary vacation period, but the other two will remain in the field until the first of October, collecting seeds of alpine plants for rock-garden use. Many of the subjects they are seeking have never before been cultivated, while others are known to be rare or extremely difficult to grow. The seeds collected will be distributed among a limited group of patrons of horticulture in the United States and several foreign countries, whose contributions have made the trip possible. Besides individual growers and plant collectors, the seeds will be shared by the Garden Club of America and the Royal Horticultural Society in the British Isles. All who receive seeds will coöperate with the Botanical Garden in testing these new American alpines in cultivation. Among the foreign growers who are interested in the western trip are people with gardens in England, Scotland, Holland, Germany, Switzerland, France, and Czechoslovakia.

THE JAPANESE BEETLE SITUATION

Forty-two traps baited with geraniol and eugenol, 9:1, to attract Japanese beetles, have been set up like so many Japanese lanterns along the borders surrounding Conservatory Range 1 at The New York Botanical Garden. From July 10 to 15, about 15,000 beetles a day were caught in these traps and promptly destroyed. The morning of July 17, the figure suddenly jumped

FIGURE 1. Traps to catch Japanese beetles in the borders adjacent to Conservatory Range No. 1.

to 24,000 for a 24-hour period. It is believed that a proportionately larger number could be destroyed if more traps were installed. Meanwhile, W.P.A. volunteer workers are keeping busy many hours of the day, handpicking beetles from the flowers.

Although the invasion of the Japanese beetle into the Botanical Garden presents a problem which demands persistent attention, traps were not set up in the Rose Garden this year as previously. Instead, an attempt is being made to keep the beetles away by treating the grass plots and strips around the roses with arsenate. Lead arsenate was also applied to a broad stretch of lawn last year near Conservatory Range No. 1. If more arsenate were available, the war on the Japanese beetles would undoubtedly be more successful, in the opinion of the Plant Pathology department. "There is no question," says Dr. B. O. Dodge, "that unless strenuous measures are taken and repeated, the Japanese beetle

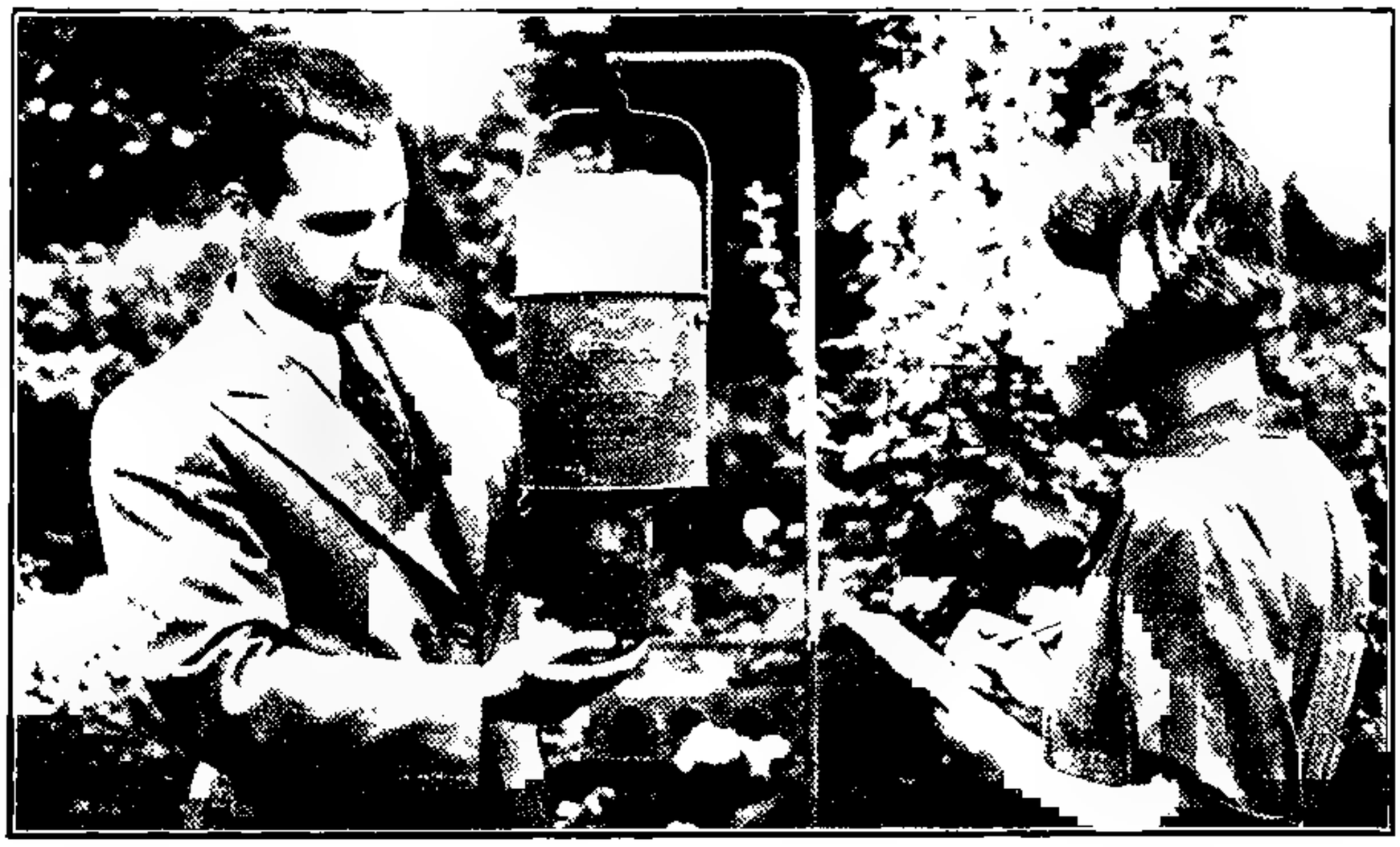

FIGURE 2. Counting the beetles, 200 to the inch, before dumping them in a paper bag in which they are destroyed.

will do irreparable damage to home gardens and parks around New York City. This pest is here to stay, and we must all work to keep it under as much control as possible."

The Botanical Garden daily receives calls from people requesting information on how to fight the beetles in their own gardens. To these it is suggested that the battle will be effective only if all the neighbors join in the fight. Traps baited with geraniol will only serve to attract beetles to one's property, and while on the way they may do considerable damage by eating foliage, the people are told. But if everyone puts up traps, many thousands of beetles will be eliminated. Arsenate of lead spread on lawns at any time of the year will be helpful in reducing the numbers of this pest. Plants may also be sprayed with arsenate of lead, but if they bear fruit which is to be eaten, it must be very carefully washed. It is suggested rather that on grapes and other edible garden products, derris dust be used instead of arsenate. The active principle of derris is said to be both a stomach poison and a repeller for the Japanese beetle, while it is not poisonous to human beings.

A GLANCE AT CURRENT LITERATURE*

The "alkali" disease that has killed off many domestic animals in the western prairie states has been found to be largely caused by the absorption of selenium from the soil by plants on which the animals feed. A report of all that has so far been discovered of this situation (it was only five years ago that selenium was found to be the toxic principle in certain cereals that had caused trouble) is given by Sam F. Trelease and Alan L. Martin in *The Botanical Review* for July. Cretaceous shales have been noted as the worst offenders in giving rise to selenium-affected plants. Some grazing lands have had to be abandoned because of the disastrous effect of the pasturage on the cattle. Some of the so-called "loco-weeds" of the west have been found to be seriously poisonous only when grown on shale soils from which they absorb selenium. Much more research is needed, the authors point out, to determine the extent of selenium soils and their danger to animals, crops and human beings.

* * *

Early vegetation on Long Island is the subject of the Brooklyn Botanic Garden's *Record* for July. Prepared by Henry K. Svenson of the Brooklyn Garden's staff, it is a Long Island Tercentenary publication.

* * *

Cornell Extension Bulletin 342 deals with roses for the garden, in a well-illustrated number of 53 pages. Those who would like to know which roses to plant for vigor and hardiness, for beauty in different parts of the garden, and how to care for them, may obtain the bulletin free by writing to the Office of Publication, College of Agriculture, Ithaca, N. Y.

* * *

The tent-caterpillar situation is frankly faced by Dr. E. P. Felt in the July 1 number of *Horticulture*. He classifies it as a nuisance rather than an actual danger, and recommends only local measures for its control, emphasizing the value of the training given to youngsters when Scout groups undertake the task.

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* All publications mentioned here—and many others—may be found in the Library of The New York Botanical Garden, in the Museum Building.

Among the 1936 *Contributions* from the Botanical Laboratory and The Morris Arboretum of the University of Pennsylvania is a translation by Esther Louise Larsen of Pehr Kalm's "Description of Maize, How it is Planted and Cultivated in North America, together with the Many Uses of this Crop Plant." The long paper was written in 1752, shortly after Kalm's visit to North America. This is the first time a translation has ever been published.

* * *

Softwood heeled cuttings are recommended for the propagation of certain deciduous trees by C. C. Thomas of the United States Department of Agriculture. His findings are the subject of a well-illustrated article in the *National Horticultural Magazine* for April. While maples are the chief consideration in this report, results of experiments with other types of trees are also given.

* * *

Spring flowers of Alaska are shown in nearly a dozen beautiful photographs by Maxine Williams in *Nature Magazine* for June.

* * *

Eradication of trees afflicted with the Dutch elm-disease appears to be continuing in a satisfactory manner. A report from the Bureau of Entomology and Plant Quarantine, published in *The Plant Disease Reporter* of June 15, indicates that during May only three trees in New York were confirmed as infected with *Graphium Ulmi,* but that four trees were removed. In New Jersey, 29 trees were confirmed and 29 removed. No signs of the disease were reported from Connecticut during the month. To date, the 4,792 diseased trees in these three states have been cut and burned to prevent further spread of the infection.

* * *

A useful list of pavement plants is given by P. J. Van Melle in the *Florists' Exchange* for July 11. *Arenaria verna* var. *caespitosa*, he says, is the one plant of the group which meets all the requirements.

* * *

The first of two articles on the flora of the Watchung Mountains by Harold N. Moldenke appears in the May-June issue of *Torreya.*

CAROL H. WOODWARD.

NOTES, NEWS, AND COMMENT

Nearly 400 varieties of dahlias are growing vigorously in their accustomed border on the west side of the grounds, adjacent to the New York Central station. This year's collection includes, among its 1,100 plants, 13 varieties which have received Certificates of Merit from either the Storrs or East Lansing trial grounds in the last year, 24 pompons which are new to the Garden, 70 new miniatures of both formal and informal types, 2 German varieties of mignon dahlias which are new to this country, besides about 235 varieties carried over from last year's collection. The usual autumn display is expected from the end of September through October.

* * *

Members of The New York Botanical Garden received 8,000 plants of Bearded Iris varieties during the two days of distribution announced on special cards. Each person who requested a share, in response to the announcement, was given about 50 plants of good but unnamed varieties which had previously been grown at the Botanical Garden. These represented the surplus when the new Iris Garden was planted this summer west of Conservatory Range No. 1.

* * *

Dr. W. H. Camp returned July 27 after two months of field study and collecting in the southern Appalachians, principally in the Blue Ridge of Virginia and the Great Smoky Mountains of Tennessee. Some time also was spent on Black Mountain, Kentucky, and in the region around Mt. Rogers in Virginia. His collections include more than 4,000 specimens.

* * *

P. J. McKenna, Foreman Gardener, returned July 18 after three months in the British Isles, where he visited many gardens and horticultural institutions, and collected many interesting new plants to be cultivated at the New York Botanical Garden.

* * *

Dr. John K. Small has presented to the herbarium a collection of about 13,000 mosses, liverworts, and lichens. These are all duplicates of his own collection made before he became associated with The New York Botanical Garden. The original

herbarium is at Cornell University. Specimens of the species represented have long been in the Botanical Garden's herbarium, so these duplicates will be used for exchange purposes.

* * *

Dr. Dorothy I. Parker from the University of Cincinnati is studying distribution of Indiana plants and doing some special work on liverworts during a two months' fellowship at the Garden. Mr. John V. Watkins, Assistant Horticulturist at the College of Agriculture, Gainesville, Florida, another fellowship student, is spending a month on work with daylilies.

* * *

Miss Rachel Kelly from the University of Virginia is spending August and September on a fellowship at the Garden studying mosses in the Elizabeth Gertrude Britton Herbarium.

* * *

Drs. Stanley Cain and L. R. Hesler of the University of Tennessee were visitors at the Garden during July. Dr. Cain is teaching this summer at the Cold Spring Harbor Laboratory on Long Island.

* * *

Mrs. Jerome W. Coombs' forthcoming book, "South African Plants for American Gardens," is announced by F. A. Stokes Company for early fall publication. Mrs. Coombs has long been interested in South African plants and brought back from a recent trip to South Africa a number which are now growing at The New York Botanical Garden.

* * *

An enlarged laboratory named in honor of Prof. G. E. Stone of the Massachusetts Agricultural College, was dedicated in Stamford, Conn., July 20, at the sixth scientific meeting of the Bartlett Tree Research Institute. Dr. Stone, who was a pioneer in shade tree research in this country, was present to reply to Dr. E. P. Felt's address of dedication. The day's program included talks and discussions on the care and protection of shade trees, followed by an old-fashioned clam-bake in the evening. Drs. F. J. Seaver and B. O. Dodge attended.

REVIEWS OF RECENT BOOKS

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

Rhododendrons and Azaleas

With the publication of Clement G. Bowers' "Rhododendrons and Azaleas," American horticulturists—in fact, growers all over the world—are given a complete and commendable guide to this magnificent group of shrubs. Within the 549 large pages are contained facts of importance for the everyday gardener, the professional grower, the collector, the breeder, and the botanist. The book is well illustrated with appropriate line drawings, a dozen splendid photographs, and 29 full-page colored reproductions of species and hybrids of rhododendrons and azaleas. The paintings were made by the late Franck Taylor Bowers.

After the opening chapters, which are good reading in themselves, the author presents a thoroughly practical discussion of the conditions under which rhododendrons can best be cultivated. Useful lists of species and varieties are given. Subsequent chapters include every phase of propagation and breeding, besides a history of *Rhododendron* hybrids, followed by 164 pages of notes on the series and natural species, then 76 more on the hybrid races and clones.

In the appendix are notes and tables on pests and diseases, behavior of new introductions in America, geographical distribution of species, succession of bloom, classified lists of species considering height, hardiness, color, and merit, taxonomic keys, and a long bibliography. The end-papers are maps showing distribution of rhododendrons in the Old and the New Worlds.

Carol H. Woodward.

Tuberous Begonias

George Otten has written his book on tuberous-rooted begonias[2] admittedly for the "dirt" gardener. First discussing briefly the origin of the present-day groups, he rather restricts himself to what might be termed a florist's classification, offering a representative list, though it covers only a fraction of the many named hybrids.

Chapters on propagation and other cultural details are well handled, yet it is doubtful whether the information would all be

[2] Otten, George, Tuberous-rooted Begonias and their Culture. 84 pages, 35 photographs. A. T. De LaMare Co., New York 1935. $1.25.

applicable in this part of the country, for so far, in the East, this plant has chiefly been cultivated under glass. Mr. Otten is writing from Oregon, where he has dealt with begonias, he says, for 55 years.

Twice in the book he recommends the begonia for the rock garden, saying in one place that *Begonia tuberhybrida pendula* "in a shady place in the rock garden . . . will fill the space with an abundance of flowers the entire summer." This, it seems certain, would be taboo in the eyes of many of our enthusiastic rock gardeners.

Although no mention is made of begonia mites or leaf nematodes, the recommendation of cyanogas fumigation would probably be an insurance against these well-known pests.

The 35 illustrations, showing methods of culture and types of flowers, are in the main clear and helpful for the beginner in begonia culture.

The author claims no knowledge of a previous book on this subject, but we have one before us published in England 40 years ago: "How to Grow Begonias, A Handbook for Amateurs", by G. A. Farini. It is exclusively on tuberous begonias.

JAMES G. ESSON.

VEGETABLES AT HOME

On the whole, the beginning gardener who wants to grow vegetables and berries will find out how to do it from Adolph Kruhm's new book.[2] After all, Mr. Kruhm does know how to raise these useful plants, and he gives the essential details in a lucid style which wastes no words, supplementing the chapters which outline the culture of each product with numerous tables telling when to plant and what to expect.

Since the average housewife who wishes a tight, slender bunch of blanched leaves for a salad asks at the grocery store for "endive," while if she wishes the large curly head of leaves, bitter and blanched in the center, she asks for "chicory," it would have been helpful if the author had made the distinction between these two clear. To use only their usually accepted catalog names of "witloof" and "endive" is confusing to many, for 95 per cent of the people need to be set right on these interchangeable names.

The best argument that the author offers for growing one's own vegetables (which so often cost more than those bought in the market) is that they are much sweeter and tenderer when eaten soon after picking than they can possibly be after time has been lost between farmer and consumer.

CAROL H. WOODWARD.

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[2] Kruhm, Adolph, How to Grow Vegetables and Berries. 88 pages, illustrated. Doubleday, Doran, Garden City, N. Y. 1936. $1.

PUBLICATIONS OF THE NEW YORK BOTANICAL GARDEN

An Illustrated Flora of the Northern United States and Canada, by Nathaniel Lord Britton and Addison Brown. Three volumes, giving descriptions and illustrations of 4,666 species. Second edition, reprinted. $13.50.

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pages and 601 figures. 1932. Price, $5.50 postpaid.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages. 1935. $1.65.

Flora of Bermuda, by Nathaniel Lord Britton and others. 585 pages with 494 text figures. 1918. $3.50.

A Text-book of General Lichenology, by Albert Schneider. 230 pages: 76 plates. 1897. $2.50.

Mycologia, bimonthly, illustrated in color and otherwise; devoted to fungi, including lichens, containing technical articles and news and notes of general interest. $6.00 a year; single copies $1.25 each. Now in its twenty-eighth volume. Twenty-four Year Index volume $3.00 in paper, $3.50 in fabrikoid.

Addisonia, semi-annual, devoted exclusively to colored plates accompanied by popular descriptions of flowering plants; eight plates in each number, thirty-two in each volume. Subscription price, $10.00 a volume (two years). [Not offered in exchange.] Now in its nineteenth volume.

North American Flora. Descriptions of the wild plants of North America, including Greenland, the West Indies, and Central America. Planned to be completed in 34 volumes, each to consist of four or more parts; 81 parts now issued. Subscription price, $1.50 per part; a limited number of separate parts will be sold for $2.00 each. [Not offered in exchange.]

Brittonia. A series of botanical papers. Subscription price, $5.00 per volume. Now in its second volume.

Contributions from The New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above. Price, 25 cents each. $5.00 per volume. In the fourteenth volume.

Memoirs of The New York Botanical Garden. Price to members of the Garden, vols. I-VI, $1.50 per volume; to others, $3.00. Vol. VII, $2.50 to members; to others, $5.00. Vol. I. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Per Axel Rydberg. Vol. II. The Influence of Light and Darkness upon Growth and Development, by D. T. MacDougal. Vol. III. Studies of Cretaceous Coniferous Remains from Kreischerville, New York, by A. Hollick and E. C. Jeffrey. Vol. IV. Effects of the Rays of Radium on Plants, by Charles Stuart Gager. Vol. V. Flora of the Vicinity of New York, by Norman Taylor. Vol. VI. Twentieth Anniversary of The New York Botanical Garden. Vol. VII. Includes New Myxophyceae from Porto Rico, by N. L. Gardner; The Flower Behavior of Avocados, by A. B. Stout; Plants Collected in the Amazon Valley, by H. H. Rusby; and The Flora of the Saint Eugene Silts, by Arthur Hollick.

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Greenhouses, containing thousands of interesting plants from America and foreign countries.

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B. O. DODGE

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THE JUNGLES OF MANHATTAN ISLAND—I

SHRUBS AND TREES OF FORT WASHINGTON PARK

The latest catastrophe has depopulated Manhattan Island of its native vegetation almost as completely as did the glaciers during the Ice Ages when they held boreal and temperate North America (as now understood) in their frigid grip. This catastrophe is nothing less than human occupation. Its progress has been slow but sure, so that today only about 200 acres of native vegetation out of the total of 14,200 acres remain reasonably intact; thus 14,000 acres of Manhattan Island have been despoiled of their native vegetation, both woody and herbaceous.

It is true the 42 parks of Manhattan, with their more than 2,100 acres, are largely populated with plants, but their floristics are mostly or totally of an exotic complexion.

Whatever may have been the soil-superstructure of the rock-foundation of Manhattan Island before the glaciers advanced, the ice pushed it from the rocks. Whatever soil-superstructure the retreating glaciers deposited on the rock foundation, erosion by wind and water naturally depleted to a great extent before man's advent on the island. The vegetation that clothed the island when the white man took charge of its destinies shortly after the year 1600, therefore had rather poor pickings for anchorage and sustenance, as compared with the rich soil we know in some of the surrounding flat country.

Fort Washington Park is in the process of an evolution. This has been going on since it was first occupied by the white man many years ago. Its area does not represent an integral formation as does its sister, Inwood Hill Park, lying just to the north. It is a slice, so to speak, of a ridge of rock running north and south, cut off from the higher part of the ridge by Riverside Drive. It lies parallel and close to the Hudson River. Little of it, however,

is visible from the Drive, for a large part of it falls off as a steep slope from the outer edge of the highway. In fact, about one half of the park area stands more or less perpendicular, while the other half lies more or less horizontal.

During the ages since the glaciers deposited exotic soil on the area most of this has naturally been washed down and out into the Hudson River where it lies at the bottom of the deep gorge through which the river flows, or in the bay or spread out on the nearby ocean bottom. However, sufficient soil has clung to the rocky teeth of the steep slopes or cliffs and remained in place at the bottom of the slopes to support a generous growth of shrubs and trees. Deducting the amount of land represented in improvements, we are safe in assuming that about 100 acres of the park remain in their native condition.

Fort Washington Park as limited by municipal park planning has only one exposure. It faces the west, and gets very little direct sun until toward noon. This condition is reflected in the number of native trees and shrubs as compared with the total (to be published later) growing in nearby Inwood Hill, which has exposures represented by every point of the compass. On pages 204-5 is a list of the trees and shrubs now growing naturally in the park, that may be observed from the trails. Of definite interest now, this list will become of increasing interest as time goes on, for a century or five centuries hence the vegetation of the park may be materially changed.

The peculiar situation of Fort Washington Park results in a very luxuriant growth of shrubs and trees. The highest natural altitude in Manhattan is in Fort Tryon Park near old Fort Washington. The newer park overlooks Fort Washington Park, rising between one and two hundred feet above it. The natural drainage of the western side of Fort Tryon Park, the seepage of moisture over and through the rock structure, feeds the vegetation of Fort Washington Park. The healthy color and luster of the many native oaks[1], ashes, birches, maples, sassafras, tulip-trees, and hickories speak well for this natural supply of moisture. The exotics, such as the Osage-orange, rowan-tree, locust, tree-of-heaven, glossy linden, and catalpa likewise thrive there peculiarly well.

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[1] The botanical names of the shrubs and trees mentioned in the following notes are affixed to the popular names in the lists on pages 204-5.

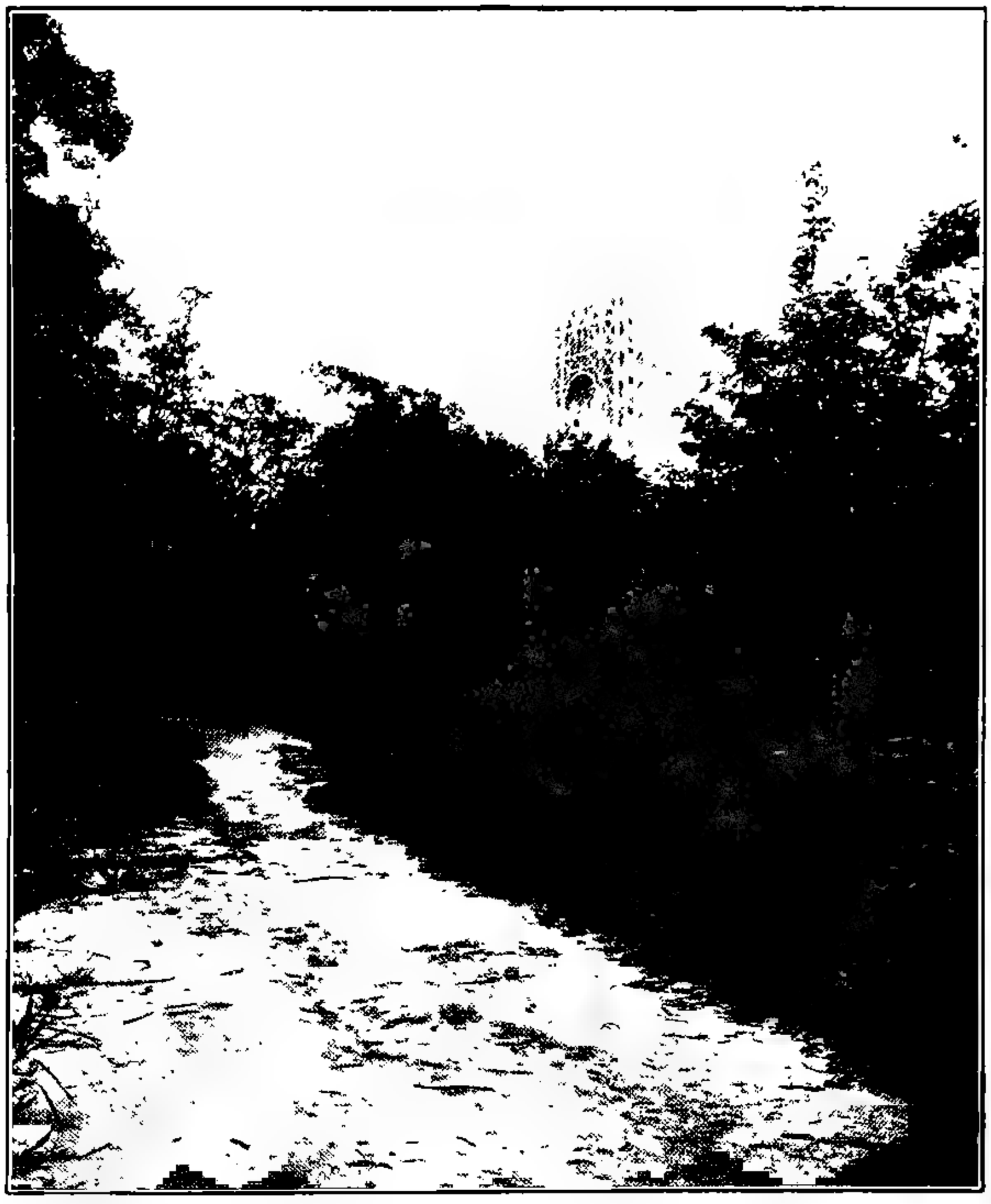

FIGURE 1. Trail in Ft. Washington Park, Manhattan, lined with shrubbery. The New York tower of the George Washington bridge shows in the distance.

The oaks, seven kinds in all, form the outstanding vegetation on account of the number of trees and masses of smooth and glossy foliage, especially that of the red and the black oaks. The three hickories fill in many gaps with their deep-green compound leaves. The two elms lack the rigid branching of the oaks and the hickories, the more or less drooping branches bearing the dull rough-surfaced leaves.

TREES AND SHRUBS GROWING IN FORT WASHINGTON PARK

NATIVE

Pitch-pine—*Pinus rigida*

Hemlock—*Tsuga canadensis*
Greenbrier—*Smilax glauca*
Catbrier—*Smilax rotundifolia*
Cottonwood—*Populus deltoides*

Large-toothed aspen—*Populus grandidentata*
Quiver-leaf—*Populus tremuloides*
Diamond willow—*Salix cordata*

Bayberry—*Cerothamnus carolinianum*
Black walnut—*Wallia nigra*
Bitter-nut—*Hicoria cordiformis*
Mocker-nut -*Hicoria alba*
Pignut—*Hicoria glabra*
Ironwood—*Ostrya virginiana*
White birch—*Betula populifolia*
Black birch—*Betula lenta*
Smooth alder—*Alnus rugosa*
Beech—*Fagus grandifolia*
Red oak—*Quercus maxima*
Pin oak—*Quercus palustris*
Black oak—*Quercus velutina*
Gray oak—*Quercus borealis*
Scarlet oak—*Quercus coccinea*
Chestnut oak—*Quercus montana*
White oak—*Quercus alba*
American elm—*Ulmus americana*
Slippery elm—*Ulmus fulva*

Hackberry—*Celtis occidentalis*
Mulberry -*Morus rubra*

Tulip-tree—*Liriodendron Tulipifera*

Witch-hazel—*Hamamelis virginiana*
Sweet gum—*Liquidambar Styraciflua*

Blackberry *Rubus ostryifolius*
Island blackberry -*Rubus rhodinsulanus*
Mountain blackberry—*Rubus allegheniensis*
Dewberry—*Rubus flagellaris*
Southern dewberry—*Rubus Enslenii*
Black raspberry—*Rubus occidentalis*

NATURALIZED

Black pine—*Pinus nigra*

White poplar—*Populus alba*

Weeping willow—*Salix babylonica*
Hazelnut -*Corylus maxima*

Camperdown elm—*Ulmus glabra*

White mulberry *Morus alba*
Osage-orange—*Toxylon pomiferum*

Thunberg's barberry *Berberis Thunbergii*
Mockorange—*Philadelphus coronarius*

Syringa—*Philadelphus grandiflorus*

Hedge rose—*Rosa multiflora*
Rowan-tree—*Sorbus Aucuparia*
Pear—*Pyrus communis*
Apple—*Malus Malus*

Haw—*Crataegus pedicellata*
Wild cherry—*Padus virginiana*
Choke cherry—*Padus nana*

Pin cherry *Prunus pennsylvanica*

Sour cherry—*Prunus Cerasus*

Plum—*Prunus domestica*
Peach—*Amygdalus Persica*
Locust—*Robinia Pseudacacia*
Tree-of-Heaven—*Ailanthus altissima*

Dwarf sumac—*Rhus copallina*
Staghorn sumac *Rhus hirta*
Smooth sumac—*Rhus glabra*
Poison-ivy—*Toxicodendron radicans*

Asiatic bitter-sweet—*Celastrus articulatus*

Red maple—*Rufacer rubrum*
Sugar maple—*Saccharodendron barbatum*

Horsechestnut *Aesculus Hippocastanum*

New Jersey tea—*Ceanothus americanus*

Shrubby-althaea—*Hibiscus syriacus*

Fox grape—*Vitis Labrusca*
Silver grape—*Vitis argentifolia*
Virginia-creeper—*Parthenocissus quinquefolia*

American linden—*Tilia americana*
Gray linden—*Tilia neglecta*
Michaux-linden—*Tilia Michauxii*

Glossy linden *Tilia euchlora*
Broad-leaved linden—*Tilia platyphyllos*

Sassafras—*Sassafras Sassafras*
Spice-bush—*Benzoin aestivale*

Gumé—*Elaeagnus umbellatus*

Dogwood—*Cynoxylon floridum*
Sour-gum—*Nyssa sylvatica*
Deerberry -*Polycodium stamineum*

Lilac—*Syringa vulgaris*

Low blueberry—*Cyanococcus vacillans*

Privet—*Ligustrum ovalifolium*
Privet—*Ligustrum acuminatum*

White ash—*Fraxinus americana*

Karri-tree *Paulownia tomentosa*
Trumpet-flower—*Bignonia radicans*
Catalpa—*Catalpa Catalpa*
Catawba-tree—*Catalpa speciosa*

Squash-berry—*Viburnum acerifolium*
Arrow-wood—*Viburnum dentatum*
Black-haw—*Viburnum prunifolium*
Elder—*Sambucus canadensis*

Japanese-honeysuckle—*Nintooa japonica*
Honeysuckle—*Lonicera Morrowi*

FIGURE 2. Oaks, tulip-trees, and hickories predominate along this trail.

The three native lindens with their broad drooping leaves, green above and green or silvery-white beneath, are only sparingly represented. The two maples, red and sugar, with leaves and bark respectively pale and dark, occur frequently. Paired like the maples are the birches, white and black, also with contrasting leaves and bark, respectively pale and dark. Paired also are the aspens or cottonwoods—the large-toothed aspen and the quiver-leaf—these

showing respectively dark and light, the leaves ever-quivering as a result of the laterally flattened and very pliable stalks. Native conifers are scarce, though pitch-pine and hemlock may be seen.

Filling in the greenery among the trees mentioned above are thousands of individual specimens—for example, the ironwood with its rough bark and dull birch-like leaves; the beech with its very pale bark and shining birch-like leaves; the tulip-tree with its square-cut leaves; the sweet-gum with its starry leaves; the sassafras which has either broad entire or deeply lobed aromatic leaves; and the white ash with its compound leaves. The dogwood, fortunately, is wide-spread and conspicuous in the spring by its inflorescence and in the fall by its bright-red fruits. The black walnut, a relative of the hickories, is very rare.

The kinds of shrubs are much fewer than the trees. Omitting the vines, the common ones number scarcely more than a dozen, the diamond willow, bayberry, witch-hazel, New Jersey tea, deer-berry, blueberry, squash-berry, arrow-wood, and elder being those most frequently noticed. Also easily seen are the three kinds of sumac—dwarf, staghorn, and smooth—especially when ornamented with their torch-like panicles of flowers or fruits. Their close relative, the poison-ivy, is ubiquitous.

The woody vines are prominent, two kinds of smilax—catbrier and greenbrier—and two grapes—summer and fox—and their relative, the Virginia-creeper, being most conspicuous.

The naturalized shrubs and trees, in actual numbers are in the minority, although about three dozen different kinds are in evidence. Fully two dozen of these are of ornamental origin. The black pine, white poplar, weeping willow, mock-orange, horse-chestnut, shrubby-althea, karri-tree, and catalpa are widely known. Among the ornamental vines may be mentioned the Asiatic bitter-sweet, trumpet-flower, and Japanese honeysuckle. Shrubs and trees of economic origin—food plants—are prominently represented, for example: the white mulberry, pear, apple, sour cherry, plum, and peach. Among the rarer or more unusual exotic trees are the Camperdown elm and the glossy linden.

The native and the exotic shrubs and trees grow and thrive in each other's company. The vines frequently bind the shrubs into almost impenetrable thickets, hence there still remain jungles on Manhattan Island.

JOHN K. SMALL.

SEED REPRODUCTION OF SHORTIA GALACIFOLIA

Although *Shortia galacifolia* has considerable potential value for horticulture, it is known to comparatively few people in its own habitat. This is because of the fact that it is restricted to a very few small areas in the Appalachian mountains.

No reason for this extreme localization has yet been given; it is not due to soil conditions, nor to exposure or other such influences; similar soil and exposures exist over very large areas; also, the plant is very adaptable when transplanted, flourishing in a variety of garden soils.

The explanation appears to lie in the unusual method of seed reproduction, for none of the well-known agencies for seed dissemination are available for *Shortia* seeds.

It is stated in Bailey's Cyclopedia of Horticulture that seed cannot be collected because the seed-stems rot before the seeds ripen. This is correct as to the rotting of the stems, but the writer had not observed the fact that the seeds not only ripened but also germinated before decay took place.

On my first attempt to collect seed I was disappointed, as the stem and seed-head were already decayed. Next season, the plants were examined frequently, but the heads and stems showed none of the usual signs of maturing. The stems remained soft and fleshy and had swollen, especially at the upper end, to more than twice the size they had been when the flowers matured, and had turned to a grayish-pink color.

Returning after a few days' absence, I found that again I was too late. Most of the stems had decayed and fallen over, but no seeds could be found in the seed-heads; other undecayed stems were found surmounted by a number of embryo plants which were pushing their cotyledons out between the stiff, fleshy scales surrounding the ovary.

Having occasionally seen seeds of certain plants germinating after damp and cloudy weather, before they had become detached from the plants, I concluded that this was a similar case.

The following season I made frequent inspections with a glass and, from time to time, opened the seed-heads.

It then became evident that the seeds did not, and could not, ripen and dry like other seeds, because they were firmly held

against the ovary by the very stiff, fleshy scales and, also, that they germinated while in this position.

As the seedlings developed, the stems decayed and fell over.

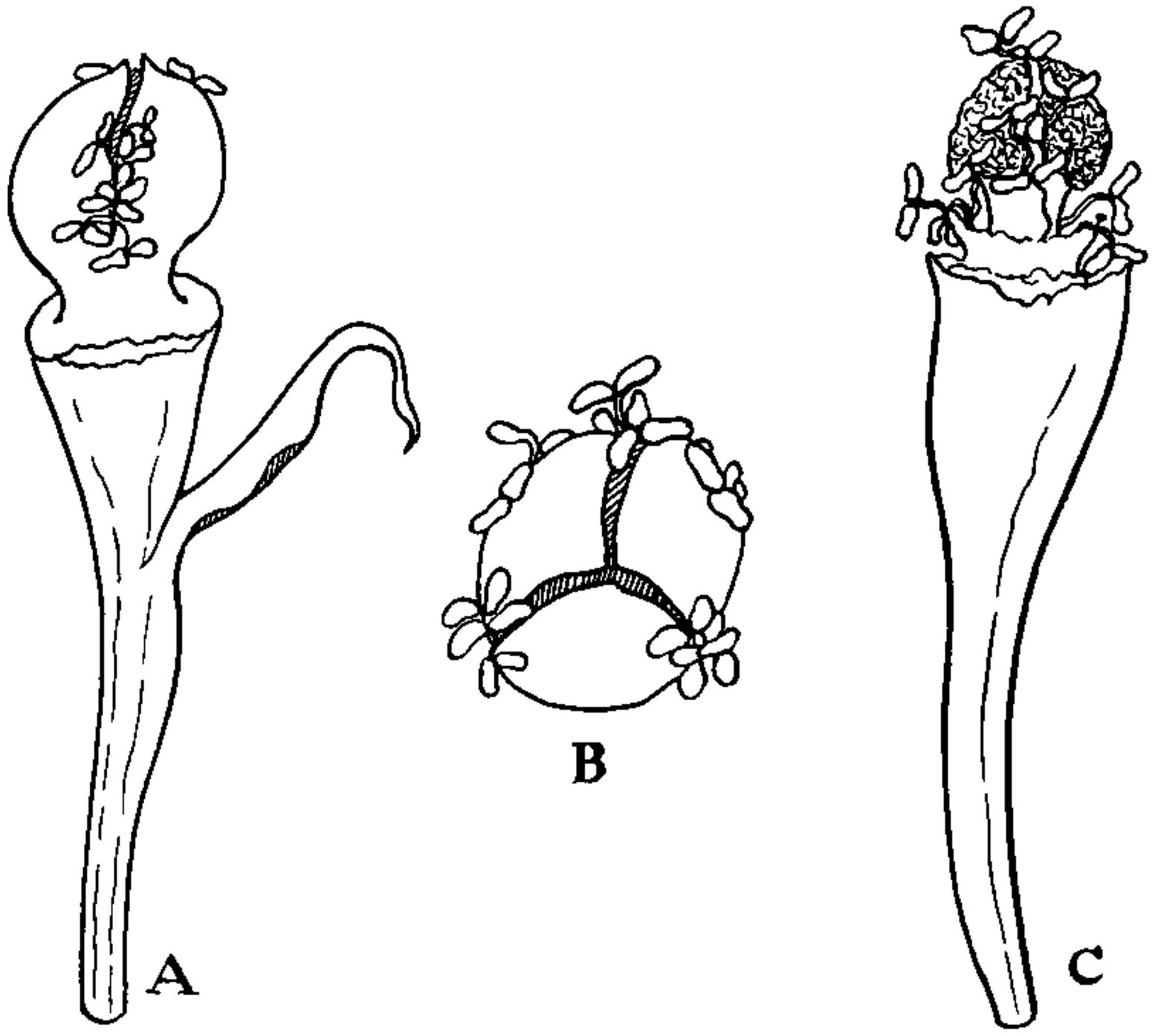

FIGURE 1. Germination of seeds of *Shortia galacifolia*. A. Seedhead with sepals detached, showing the swollen stem and the seeds germinating within the ovary. B. Seed-head as seen from above. C. Sepals and scales detached, revealing the seedlings still attached to the ovary.

No connection could be found between the hypocotyl and ovary for the transmission of nutriment, though moisture from rain and dew would be retained.

A number of the germinating seeds were removed on a needle and planted on a peat and sand mixture; these lived and grew—very slowly; others were allowed to remain in place and planted with a piece of ovary and scale; these lived but have produced no secondary leaves after eight months. Ungerminated seeds from the same heads did not germinate in the soil.

Normally, *Shortia* grows in a dense mass, spreading from underground runners.

The only apparent agency for freeing the embryos from the decayed ovary is heavy rain, and the minute plants washed into

this mass would have little chance of survival. In fact, few would escape, as they are destroyed by insects at night in many cases.

Thus, there seems little possibility for the natural dispersal of the plant by seed.

On some hand-pollinated plants which I have indoors where they can be closely watched I find that the head splits open from two to three weeks after fertilization. The seeds are then brown, and

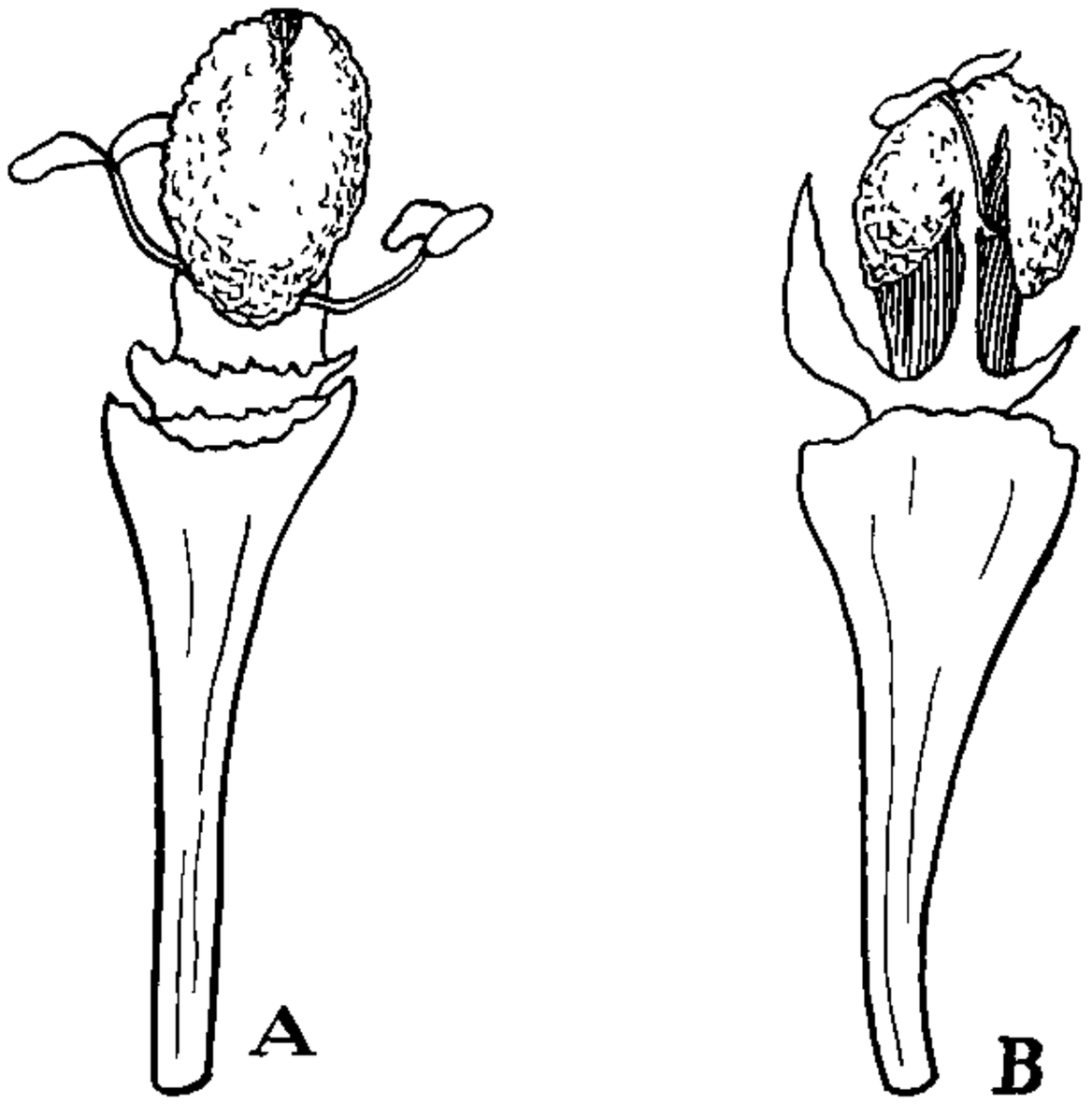

FIGURE 2. A and B. Two views showing how the seedlings of *Shortia galacifolia* are retained by pressure under the edges of the ovary.

those opposite the openings gradually fall out into the cup-like calyx, where I found them germinating in previous seasons. The remainder are held in place. The seed-stems on these plants indoors did not become fleshy, nor did any of the seeds germinate, possibly because of the dry atmosphere and the non-exposure to rain.

The unusual weather conditions of 1936 have interfered with the continuity of these observations. There was no rain for more than two months in this area, the heat was continuous, atmospheric moisture, consequently, was practically nil, and there were no dews. Both rain and dew are probably necessary for the maturing of the stem and ovary.

This year the stems developed normally after flowering but became stiff, retained their green color, and did not enlarge.

The ovary also remained green and it shrank sufficiently to allow

the seeds to shake out. These seeds did not attain the dark color they have had previously. Attempts to germinate them on peat and sand were not successful.

The interesting effect of this dry, hot season is that *Shortia* plants in the different areas (one at 5,000 feet, the others at about 2,500 feet) have developed markedly greater growth and larger leaves than in normal seasons. What the effect on the next blooming season will be remains to be seen.

Looking to the future, and considering the rapidly increasing number of visitors to these mountains, it is not out of place to propose that a restriction should be placed on the removal of wild *Shortia;* or, state reserves might be established in the areas where it grows.

Edelweiss, which seeds profusely, was rapidly disappearing on the accessible northern slopes of the Alps until such restrictions were imposed.

MALCOLM N. ROSS,
Arden, N. C.

MARIGOLD WILT

In a recent edition of the New York Herald Tribune a correspondent asks the Gardeners' Forum for suggestions regarding a certain marigold trouble. It was said that the plants do fairly well at first, but later the leaves begin to turn brown and the flower buds fail to open normally. In the absence of specimens the editor suggested that there was a bacterial wilt of marigold but thought that the trouble sounded more like a fungous wilt or blight.

We have had a similar trouble not only with the African marigold, *Tagetes erecta* (FIGURE 1), in two or three plantings this summer but also with certain dwarf varieties, *T. patula* and *T. signata pumila*. In one bed of African marigolds a number of plants began to show signs of a wilt disease when they were about a foot high. Infected plants usually died within a few days after first showing the symptoms. They could then be pulled up easily and one could see that the root system had been mostly destroyed (FIGURE 2) and that the bark at the base of the stem had been rotted away, exposing the wood fibers. Farther up the stem one could usually see flesh-colored masses of fungus spores which upon microscopic examination proved to be spores of a *Fusarium*.

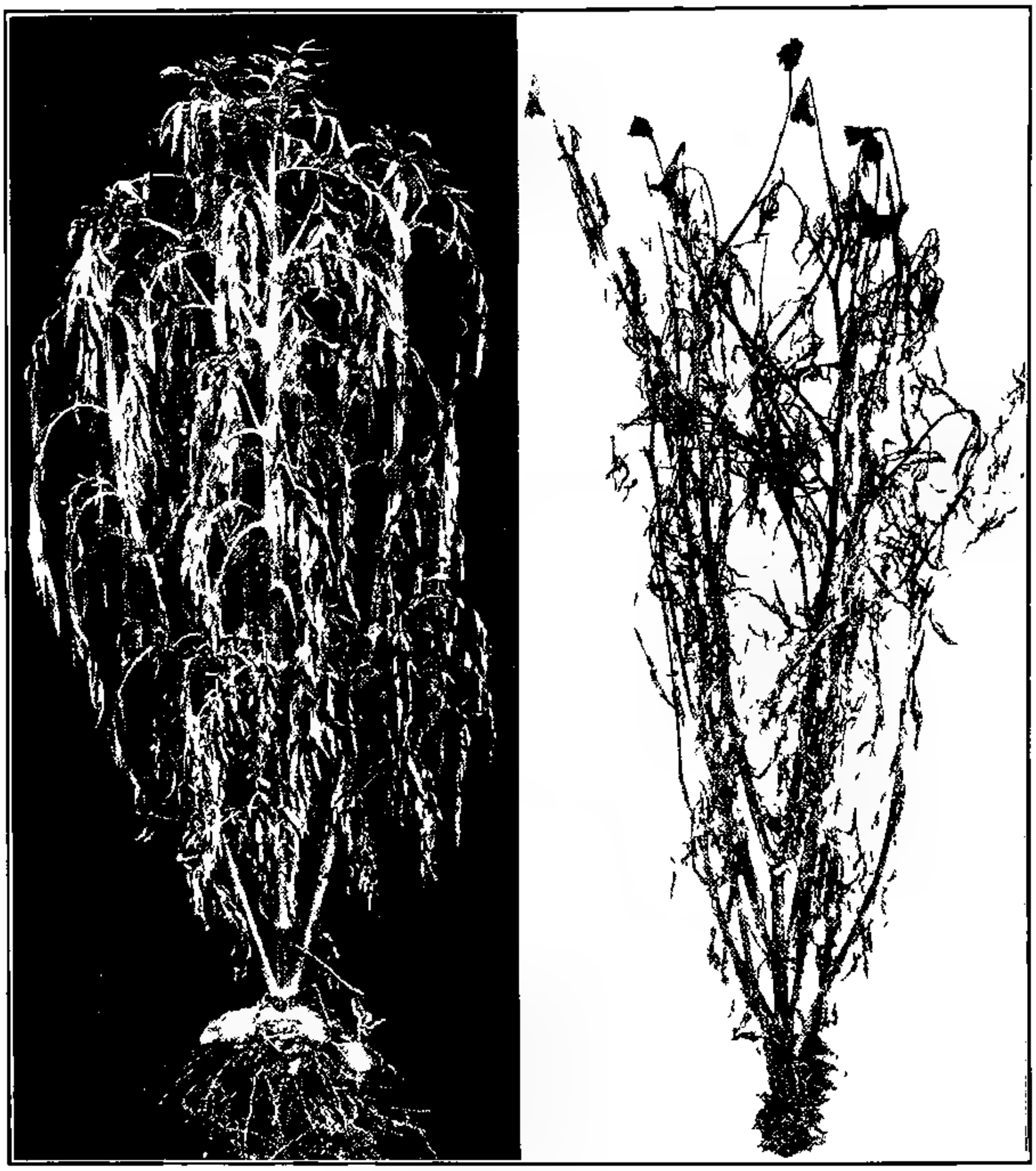

FIGURE 1. At the left is a rather young African marigold, *Tagetes erecta*, in the first stages of the wilt. At right, an older plant that was killed in August about a week after first showing the wilt

A species of *Verticillium* occurs apparently as a secondary rot at the base of dying plants.

In general, the dying marigolds presented much the same symptoms as those shown in case of the familiar aster wilt caused by a species of *Fusarium*. In this the base of dying plants is often covered for several inches with pinkish spore masses. The identity of the species of *Fusarium* found on the marigolds has not been determined and it may not be the same species as that causing aster wilt. Should the fungus be proved to be the cause of the wilt, as seems probable, control ought not to be difficult.

As the fungus lives over in the soil from year to year and is thus ready to attack new plants, the problem resolves itself into one of soil and seed sterilization. Where one's asters and marigolds are started from seed and the plants are allowed to grow in flats for some time it would of course be necessary to start with sterilized

FIGURE 2. The basal part and root system of a dead plant, natural size. The light patches at the base of the stems at the right are spore masses of the *Fusarium*, while the more conspicuous spore masses at the left are those of a *Verticillium* which seems to be a secondary rot coming in after the plants are practically dead. Species of both of these fungi are known to cause wilts of other host plants.

potting soil, and if the plants are to be set out in a plot where plants had shown the wilt in previous years the soil in the plot should also be sterilized.

Dr. Carl E. F Guterman of the Department of Plant Pathology, Cornell University, has issued a leaflet giving directions for sterilizing rather small quantities of soil to prevent damping-off and wilt diseases of this type. He suggests that a bushel of potting soil be spread out on the bench and 2½ tablespoons of 40%

formaldehyde be mixed with about 6 tablespoons of water so that it can be sprinkled on the soil, which is then thoroughly mixed and placed in pots or flats and left about 24 hours. The seeds of most plants can then be put in. By this method the soil, seed pans and seed will all be sterilized. It has been found that the formaldehyde treatment is slightly injurious to seeds of anchusa, California poppy, campanula, hollyhock, snapdragon, and sweet rocket. The planter should therefore wait several additional hours before sowing seeds of these subjects. An important process is to water the pans thoroughly soon after the seeds are planted. Seedlings should, of course, be transplanted into soil previously sterilized.

As has been noted in this JOURNAL in other connections, for sterilizing garden plots one should see that the soil is thoroughly pulverized to eight or ten inches in depth. One gallon of formaldehyde to 50 gallons of water can then be applied at the rate of about ½ gallon to the square foot. If the amount does not soak in at the first application a second application can be made a few minutes later. If the soil is rather dry, one gallon of formaldehyde to 100 gallons of water might be preferred. This treatment will not give 100% sterilization but will go a long way toward killing out such fungi as those causing root-rots, damping-off, and aster and marigold wilts. Nematodes infesting plants will also be destroyed.

B. O. DODGE.

SCREWPINES FROM MADAGASCAR BEARING FRUIT

In House 12 of Conservatory Range No. 1 two plants of *Pandanus utilis*, the lustre screwpine, are bearing fruit this year for the first time. No male flower was discovered on either plant. The first specimen to produce a dark-green ball of fruit was a tree which the Garden acquired as a small plant 18 years ago. The second was an 11-year old cutting of the first tree, which meanwhile had grown almost as tall.

P. utilis is native to Madagascar, where it is found inhabiting the muddy banks of rivers, growing to the exceptional height of 60 feet. Our older specimen is now about 14 feet high.

In its native habitat the plant shows an interesting adaptation

Pandanus utilis in fruit for the first time in Conservatory Range No. 1.

to its surroundings. From along the trunk it throws out large stem-like aërial roots which spread out and eventually descend into the ground, giving the appearance of props. These apparently serve as anchorage for the tree in the rapid currents of the rivers and prevent its being washed out.

The upper part of the tree is formed somewhat like the base, bearing a number of stout branches which diverge or are deflexed and are crowned with tufts of leaves spirally wound in three ranks. The leaves, which are 2 to 3 feet long, are sheathed at the base, and have reddish spines along the margins. They are used for thatch and also for making bags and baskets.

The solitary fruit, which is first green, then brown, consists of a cluster of drupaceous nuts collected into a compound ball. Arising from the axil of a leaf, it hangs from a stout stalk. The nuts are imperfect but they exhibit traces of five (the number is variable) elongated cells, each with one erect ovule or seed. The fruits are expected to hang on the trees in the conservatory for several months.

P. J. McKenna.

AUTUMN LECTURES AT THE GARDEN

The annual series of free illustrated lectures given Saturday afternoons in the Museum Building at the New York Botanical Garden starts September 12 with a talk on "Autumn Wild Flowers" by Dr. John Hendley Barnhart. Other topics for the first three months include practical gardening, nature study, and travel, presented by members of the staff and friends of the institution. The lectures start promptly at 3:30 p.m. and last one hour. Following is the schedule for September, October, and November:

September 12. "Autumn Wild Flowers," Dr. John Hendley Barnhart. Bibliographer and Administrative Assistant.
September 19. "Foods of China," Dr. W. M. Porterfield.
September 26. "Next Year's Garden," Mr. T. H. Everett, Horticulturist.
October 3. "Bulbs to Plant for Spring Bloom," Mrs. Wheeler H. Peckham, Honorary Curator, Iris and Narcissus Collections.
October 10. "Trees by the Roadside," Dr. H. Beaman Douglass, Physician.
October 17. "Autumn Coloration," Dr. A. B. Stout, Director of the Laboratories.

October 24. "House Plants," Dr. Forman T. McLean, Supervisor of Public Education.
October 31. "Over the Andes and Down the Amazon," Dr. Albert C. Smith, Associate Curator.
November 7. "Economic Philippine Plants," Mr. Theodore Muller.
November 14. "Ornamental Winter Fruits," Mr. E. J. Alexander, Assistant Curator and Curator of the Local Herbarium.
November 21. "Building the New Garden," Mr. A. C. Pfander, Assistant Superintendent.
November 28. "Travels Through the Mountains of Colorado, Wyoming, and South Dakota," Dr. Fred J. Seaver, Curator.

How to Reach the Museum Building

The Museum Building is reached by the Harlem Division of the New York Central Railroad to Botanical Garden Station, by trolley cars to Bedford Park Boulevard, or by the Third Avenue Elevated Railway to Botanical Garden, Bronx Park. Visitors coming by the Seventh Avenue and Lexington Avenue subways change to the Elevated Railway at 149th Street and Third Avenue. Those coming by the Eighth Avenue Subway (Independent System) walk east from the Grand Concourse at Bedford Park Boulevard (200th Street). Those coming by the New York, Westchester & Boston Railway change at 180th Street for cross-town trolley, transferring north at Third Avenue.

COURSES OF STUDY FOR 1936-37

Beginning September 26, the first of a series of three courses in the identification of trees and shrubs will be given at The New York Botanical Garden. Studies of native species and of others commonly planted will be made in the autumn, winter, and spring.

Also in spring a course will be given on the identification and culture of the native ferns and their allies.

Fall and winter gardening will be the subject of a two month course opening September 23, while in March a beginning and an advanced class will be offered in gardening, the students at the conclusion taking home the plants they have raised.

Members of the Garden desiring to register for any of this instruction will receive credit on their fee to the amount of their annual contribution.

Following is the schedule of courses being offered, all of them under the supervision of Dr. Forman T. McLean.

1. *Tree and Shrub Studies:* Field identification studies of our native and commonly planted species in The New York Botanical Garden. 6 sessions, Saturday mornings, 9:30 a.m. to 12:30, September 26 to October 31, 1936. Fee $6. Half price to New York City teachers.
2. *Knowing Trees by their Buds, Bark, and Shape in Winter:* 10 sessions, Saturday mornings, 10:30 a.m. to 12:30, November 14, 21, 28, December 5, 12, 19, 1936, and January 2, 9, 16, 23, 1937. Fee $6. Half price to New York City teachers.
3. *Leaves and Flowers of Trees and Shrubs in Spring:* 6 sessions, Saturday mornings, 9:30 a.m. to 12:30, April 17 to May 22, 1937. Fee $6. Half price to New York City teachers.
4. *Our Native Ferns and their Allies:* Outdoor studies of their culture and identification at the Botanical Garden. 6 sessions, Tuesday afternoons, 4 p.m., April 20 to May 25, 1937. Fee $5.
5. *Fall and Winter Gardening:* Practical gardening instruction and training in the proper handling of outdoor plants in fall and management of house plants in winter. Wednesday mornings, 9:30 a.m. to 12:30, at the Propagating House. Greenhouse facilities are available during the classes. 10 sessions, September 23 to November 25, 1936. Fee $20.
6. *Spring Gardening,* under the direction of Dr. Forman T. McLean and the Garden staff of the Botanical Garden: 10 sessions of 3 hours each in practical gardening in greenhouse and outdoors. Plants are started in the greenhouses, grown by the members of the class, and taken to their own gardens in May. Fee $25.

   a—Introductory: Deals with the elementary principles of gardening. Wednesday mornings, 9:30 a.m. to 12:30, March 24 to May 26, 1937 at the Propagating House.

   b—Advanced: Special projects for people who have already completed the introductory course or its equivalent. Wednesday afternoons, 1:30 to 4:30 p.m., March 3 to May 5, 1937, excluding International Flower Show week in March, at the Propagating House.

A GLANCE AT CURRENT LITERATURE*

"What is a rock garden?" is a question which seems to be occupying horticulturists and writers on both sides of the Atlantic. In the *Gardeners' Chronicle of America* for August, P. J. van Melle replies to a previous opinion by defining a rock garden as follows:

"A rock garden is a naturalistic type of garden, inspired by nature's association of rocks and plants—either above or below timberline, in the open, or in the woods. It is not necessarily a factual reproduction of the geology or ecology of any given place, but rather, a liberal, idyllic, interpretative and affectionate creation; truthful enough for a sincere tribute to nature, and liberal enough to indulge the maker's gardening complex."

Meanwhile, the British *Gardeners' Chronicle*, in its issue of August 1, publishes the following, among other opinions:

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* All publications mentioned here—and many others—may be found in the Library of The New York Botanical Garden, in the Museum Building.

"A rock garden is a garden among rocks arranged to the satisfaction of an intellectual ideal. All other forms of gardening with rocks are more or less rockeries."—*R. Painton.*

* * *

Trees of Grand Canyon National Park are described in Bulletin 3 of the park's Historical Association.

* * *

"Forests in Flood Control" is the title of a supplemental report to the committee on flood control of the House of Representatives, compiled by E. N. Munns and Ivan H. Sims of the United States Forest Service. Foresters, claims this report, have said that "if each drop of water were held at the place where it first reaches the ground, there would be no floods." Also: "Foresters contend that . . . through proper land use, through good forest practices, and through close integration of forestry and engineering, the severity of floods can be mitigated, and that under many conditions floods may largely be prevented." The 70 pages of the report explain how forests help in flood control.

* * *

More than a thousand plants, including algae, fungi, and ferns, are included in a list of food plants of the North American Indians, appearing as Miscellaneous Publication No. 237 of the United States Department of Agriculture. Classified by families, each plant is listed by its botanical and common name, and the manner of use and source of the information about each is given. The list was prepared by Elias Yanovsky of the Bureau of Chemistry and Soils, as a preliminary to a study of chemical constituents and food value of native North American plants.

* * *

A copy of the laws applicable to the United States Department of Agriculture (1935) has recently been placed in the library. Preceded by the Constitution of the United States and followed by a 37-page index with cross-references, the laws themselves occupy 712 pages.

* * *

"More Game Birds in America" is the name of a new foundation with offices at 500 Fifth Avenue, New York City. One of the publications of the society is on food plants for waterfowl,

describing the plants required by the birds, giving details on how to plant them, and telling many ways of controlling undesirable vegetation.

* * *

How a city which boasts of one of the finest parkway systems in the land handles its trees and shrubs and flowers is being told in a series of articles by Louis Boeglin, Horticulturist for the City of Minneapolis, in *Parks and Recreation*. Lilacs and peonies are treated in the June number.

* * *

What happens to lily bulbs when the foliage is prematurely lost by late spring frosts is described by H. F. Comber in *The Gardeners Chronicle* of June 13. "The amount of healthy, vigorous foliage, coupled with the time it is retained in good condition, affords the best criterion of the future size of the bulb which is being built up for next year," concludes the author.

* * *

"The Best Philadelphus" is the subject of the Arnold Arboretum's *Bulletin of Popular Information* for June 15. Donald Wyman, the author, after describing the general treatment of mock-oranges, lists 18 species and several varieties which he deems most worthy of cultivation.

* * *

The Carnegie Institution of Washington has issued this year, as *Publication No. 462*, the results of D. T. MacDougal's work since 1918 on measuring the growth and other changes in trees by means of dendrographs. "Studies in Tree-growth by the Dendrographic Method" is the title of the book, which contains 256 pages, nine plates showing micro-photographs by Prof. I. W. Bailey, 56 figures illustrating the methods of making the studies, and many tables to indicate the records of growth and change.

Dr. MacDougal, who not only carried out this work personally at Carmel, Calif., but also directed its procedure in other parts of the world, using both native and introduced trees for comparative studies, describes the apparatus, which had to be composed of materials of low susceptibility to temperature and moisture, and describes changes recorded in tree trunks, in roots, and in woody layers of different ages.

CAROL H. WOODWARD.

NOTES, NEWS, AND COMMENT

T. H. Everett returned August 21 from Cheyenne, Wyoming, after six weeks of collecting seeds of western alpine plants in Colorado, Wyoming, Montana, and again in Wyoming, as a member of The New York Botanical Garden's Rocky Mountain Expedition. E. J. Alexander is remaining west until October.

* * *

Boris A. Krukoff left August 11 for another trip to Brazil, where he will continue research on the poisonous plants of the Amazon.

* * *

Dr. A. B. Stout addressed the Farm and Home Week gathering at the State College at Amherst, Mass., July 29, speaking on "Daylilies: Old and New."

* * *

The Garden's first major display of Michaelmas daisies, arranged in one of the borders north of Conservatory Range No. 1, is in full bloom this month. Forty-five varieties of these plants, most of which are hybrids of *Aster novae-angliae* and *A. novi-belgii,* are represented. They will be followed, in adjacent borders, by the usual collection of hardy chrysanthemums, the dahlias in the great border near the New York Central station meanwhile coming into bloom.

* * *

Flowers began opening the latter half of August on the royal waterlily of the Amazon, *Victoria regia,* which has been growing this year in the aquatic house of Conservatory Range No. 1. This house was reopened to the public during the summer after extensive reconstruction had been completed, making it possible for visitors to view the entire tropical pool and its planted borders from a rounded platform, instead of from a bridge spanning the center as formerly.

REVIEWS OF RECENT BOOKS

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

The Living Garden

Unique in its concept and elaboration, "The Living Garden"[1] reveals, not how to raise this or that kind of annual or perennial, but why one performs certain gardening operations. It explains why the gardener disturbs the soil before planting; why he protects some plants in winter; why alpine subjects must have certain conditions in the lowland rock garden, how roots behave underground and what makes them act so; why weeds appear in lawns that are frequently cut; and why certain methods of propagation must be used for certain plants.

The author, who is Quain Professor of Botany in University College at the University of London, has made the book thoroughly up-to-date, including the latest experiments and discoveries in horticultural science, such as those dealing with the effects of light and temperature on plants, the uses and methods of vernalization, and the most recent attempts at adapting rock-garden conditions to meet the needs of highly-prized alpine plants. Moreover, he mentions not only old familiar garden flowers, but also the newest ones brought into cultivation, such as *Nomocharis* and *Meconopsis*.

The illustrations add a distinctly decorative note to the book, as well as providing helpful elucidation to the text. Most charming, perhaps, are the panels showing the stages of growth of seedlings, from the instant of beginning germination to the first leaves and even the first flower. Photomicrographs of such subjects as leaf surfaces, showing stomata and scent organs, and of sections of carpels showing the fertilized ovules within, are as useful to the scientific reader as they are enthralling to the layman.

It is seldom that a gardening book of such scientific integrity appears in a form that can be enjoyed by the average lover of plants.

Carol H. Woodward.

A Four-Language Dictionary

Any book intended to assist those familiar with one language to understand clearly the ideas recorded in another is surely

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[1] Salisbury, E. J., The Living Garden, or The How and Why of Garden Life, 338 pages, illustrated. Macmillan, New York, 1936. $3.

praiseworthy, no matter how defective; no one has a right to expect perfection in such an undertaking. Books of this class are usually bilingual, and most commonly have used Latin in combination with some modern tongue, such as Latin-English or Latin-German; with two such books it is possible to find out what is the Latin equivalent of a given English word, and the German equivalent of the Latin word, and thus indirectly learn the English and German equivalents. But this is clumsy, and there has always been a demand for the few polyglot dictionaries available to botanical and horticultural workers. Perhaps the best of these for botanists has been Gatin's "Dictionnaire de botanique," published in 1924; it gives French, German, English, and Latin words in a single alphabet, but the text is all in French, and there is no cross-referencing from the French to the three other languages.

We now have a polyglot work[2] with a breath-taking title and a list of thirty collaborators crowded on the title-page, evidently intended to fill a long-felt want, and doubtless approaching its goal more closely than any previous attempt. Why, with six topics specified on the title-page, including horticulture and forestry, the word "botany" should not also appear, is decidedly strange, for most botanical terms are included, except perhaps some of the very technical ones of limited use. There is no date on the title-page, but on its reverse we read "First published in the U. S. A. 1935" and "Printed in Holland"—an unusual combination. Whether, besides this edition with title and prefatory matter in English, there were simultaneous ones in other languages, the reviewer does not know; but this would be a simple matter, as the rest of the volume could be identical.

There are four alphabets; the first is Dutch, the second French, the third English, and the fourth German; in each of these every word (or combination of words) appears with its equivalent or equivalents in the other three languages. The prominence of the Dutch language—perhaps even its inclusion in the dictionary—is due to the fact that the compiler and all of his associates are Hollanders. It is therefore safe to assume that, none of the collaborators being as familiar with French, English, or German as with his native tongue, the Dutch section of the book is the most accurate. We are concerned, however, only with the English section, and in this we may be pardoned for mentioning a few of the peculiarities.

When there exists, besides a noun, a corresponding adjective, only one usually appears, most commonly the noun (*embryo*, but not *embryonic*, *aril* but not *arillate*, *panicle* but not *paniculate*),

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[2] Bezemer, T. J., Dictionary of terms relating to agriculture, horticulture, forestry, cattle breeding, dairy industry and apiculture, in English, French, German and Dutch. vii + 267 + 249 + 251 + 295 pages. The Williams and Wilkins Company, Baltimore, [1935]. $8.

but sometimes the adjective (*paired* but not *pair, serrate* but not *serration*). At first this might seem a justifiable attempt to avoid repetition, but we find both *asymmetric* and *asymmetry, umbel* and *umbelliform* (but not *umbellate*). In cases where there is a noun and a corresponding verb, these being almost identical in each language, both often appear (*secrete* and *secretion, ferment* and *fermentation*), so it would appear that there has been no sustained effort to condense the subject-matter.

Actual errors in spelling, such as *arborious* and *advantitious,* do not appear to be frequent, but there are entries under *aequatorial* and *aestivation,* without even cross-reference under the more usual forms, *equatorial* and *estivation;* and one would hardly look for alkaline under *alcaline*. It is mildly amusing to find *acaulous,* a rare word, without any mention of the ordinary English equivalent, *stemless*.

Such instances could be multiplied indefinitely, but this would serve no useful purpose. The fact remains that this work, in spite of all its imperfections, is sure to prove a very useful one, not only in the fields specified on the title-page, but in botany as well.

J. H. BARNHART.

TWO BOOKS FOR MYCOLOGISTS

A new manual for mushroom-hunters has been published this year almost simultaneously by the State Museum at Albany and by the Macmillan Company. Written by Dr. Louis C. C. Krieger, this volume of 538 pages contains a general discussion of the fungi, directions for growing mushrooms, and descriptions and notes, both technical and popular, of the edible and poisonous species. "The Mushroom Handbook" is completely illustrated, with photographs, drawings, and 32 colored plates. When obtained from the State, it comes in paper covers for a cost of $2. The Macmillan issue, the contents of which are identical, is bound in cloth and the price is $3.50.

Dedicating his book to his father, Charles E. Bessey, and to George Klebs, another great teacher of botany, Ernst A. Bessey has written a "Text-book of Mycology" which has been recently published by Blakiston. Emphasis in this new work, which has been well received by both students and teachers, has been placed on morphology rather than physiology. Complete bibliographies of the subject conclude each chapter.

F. J. SEAVER.

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GENERAL INFORMATION

Some of the leading features of The New York Botanical Garden are:

Four hundred acres of beautifully diversified land in the northern part of the City of New York, through which flows the Bronx River. A native hemlock forest is one of the features of the tract.

Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

Gardens, including a new rock garden, a large rose garden, a perennial border, small model gardens, and other types of plantings.

Greenhouses, containing thousands of interesting plants from America and foreign countries.

Flower shows throughout the year—in the spring, summer, and autumn displays of daffodils, lilacs, irises, peonies, roses, water-lilies, dahlias, and chrysanthemums; in the winter, displays of greenhouse-blooming plants.

A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants; also historic microscopes.

An herbarium, comprising more than 1,800,000 specimens of American and foreign species.

Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

Scientific research in laboratories and in the field into the diversified problems of plant life.

A library of botanical and horticultural literature, comprising nearly 45,000 books and numerous pamphlets.

Public lectures on a great variety of botanical and horticultural topics, continuing throughout the autumn, winter and spring.

Publications on botanical subjects, partly of technical, scientific, and partly of popular, interest.

The education of school children and the public through the above features and the giving of free information on botanical, horticultural and forestral subjects.

The Garden is dependent upon an annual appropriation by the City of New York, private benefactions, and membership fees. Applications for membership are always welcome. The classes of membership are:

Annual Member	annual fee	$ 10
Sustaining Member	annual fee	25
Garden Club Membership	annual fee for a club	25
Fellowship Member	annual fee	100
Member for Life	single contribution	250
Fellow for Life	single contribution	1,000
Patron	single contribution	5,000
Benefactor	single contribution	25,000

Contributions to the Garden may be deducted from taxable incomes. Bequests may be made in the form of securities, money, or additions to the collections. The following is an approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 *of* 1891, *the sum of* ———.

Conditional bequests may be made with income payable to donor or any designated beneficiary during his or her lifetime.

Fellowships or scholarships either in perpetuity or limited to a definite period may be established for practical student-training in horticulture or for botanical research.

All requests for further information should be sent to

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JOURNAL
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LINDENS IN THE CITY OF NEW YORK AND ITS VICINITY
LEON CROIZAT

PALMS AS INDICATORS OF THE MAXIMUM WATER LEVEL
JOHN K. SMALL

THE ALPHONSO WOOD HERBARIUM
H. H. RUSBY

A BISECTED TREE WHICH FLOURISHES

PLANTING NOW FOR SPRING GARDENS
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W. H. CAMP

RAFINESQUE AND HIS FRIENDS
J. H. BARNHART

SEEDS—AND FRUITS
CAROL H. WOODWARD

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LINDENS IN THE CITY OF NEW YORK AND ITS VICINITY

To the writer's knowledge, fourteen different lindens are planted or grow native in New York City and its vicinity. The list of hardy woody plants in The New York Botanical Garden published in 1920 recorded only three species and four varieties. Today not less than eight species, or hybrids, thrive in the Garden.

The red linden (*Tilia rubra*), often said not to be in cultivation, is well represented in the parks, thoroughfares, and gardens of our city, with numerous specimens not less than fifty years old. Two varieties of it are cultivated in The New York Botanical Garden. One, (*T. rubra begoniaefolia*), which is seldom if ever planted (FIGURE 1), closely agrees with the begonia-leaf linden (*T. begoniaefolia* Stev.), originally reported from the Caucasus and considered by some authors to be a very distinct form of the red linden. This tree has a firm dark-green leaf which, except for its size, suggests the leaf of certain basswoods. The other variety which, from the insufficient data to be gathered on this difficult species, may be understood as belonging to the type itself, is commonly seen. Its leaves are yellowish-green, usually cut heart-wise at the base, and often barely distinguishable from the leaves of the common European linden (*"T. vulgaris"* of most texts), of which a young specimen thrives in the Garden. Mature trees of the red and of the common European linden grow side by side along Riverside Drive between 97th and 99th Streets, and there it can easily be shown that they are not the same "species." Evidence to this effect may be welcome because many horticulturists and some botanists believe the contrary to be true.

Both the red and the common European linden are thrifty trees but thrive best where moisture is fairly well supplied. Few plants

are more beautiful than these lindens if set in suitable ground, as, for instance, in a cool lawn. The common European linden, particularly, has found the key to a secret that not many trees have succeeded in learning. It displays a crown that is heavy and light at the same time, being able to achieve this combination of opposites because the main branches are built up in fairly even tiers, arching gracefully and carrying at the tip neat, thick sprays of dark-green leaves, lying mostly in the same plane and reaching up and down.

The hairy linden (*Tilia platyphyllos*), like the red linden, hails from Europe and resembles it in sharpness of venation, but is easily identified by the hairy leaves and by the hard, ribbed fruits. *T. platyphyllos* is used more extensively than its thriftiness warrants, at least in cities. It cuts a good figure and, indeed, is a noble tree where the soil is rich and well drained and moisture is abundant. Dry weather and insufficient watering, however, cause it to shed its leaves, and the majority of trees in the congested areas of the city are nearly bare in late August. A specimen of a cut-leaf variety is cultivated in the Garden. Seeing the tree one understands why the variety is seldom used in planting. The jagged blade looks unhealthy, and does not rival even distantly the elegant leaf of a laciniate maple or beech.

The "Stein-Linden" of the Germans, the small-leaved linden of early British authors (*T. cordata*), is a native of northern Europe, and there to all appearances an age-old migrant from Asia. It is one of the commonest, if not the commonest of lindens in cultivation, and the trade is so well stocked that it is inclined to supply this even when not requested. The leaf of *T. cordata* is small, somewhat square-sided, seldom more than 3 inches long, mostly bluish underneath, and hairless except for brownish woolly tufts at the forks of the veins. The small-leaved linden bears many flowers and large crops of fruits in clusters that tend to lie horizontally, and persist often until late in winter. This habit, combined with the green or yellow buds that contrast with the reddish-brown color of the tip of the twig, easily identify the species in its leafless condition. Certain trees have a peculiar aspect on account of damages from frost. The trunk cracks, and in time stout limbs often flattened at the sides grow from the wound. An old tree so damaged stands in Prospect Park, east of the drive at the foot of the Quaker Cemetery.

FIGURE 1. *Tilia rubra begoniaefolia*, growing at The New York Botanical Garden. This rare tree agrees with the true *T. begoniaefolia*, which has been described from the Caucasus.

Tilia cordata has been crossed with the hairy linden and with the red linden. As a result two hybrids have originated and are on the market: the common European linden ("*T. vulgaris*"), of which we have spoken, and the glossy linden (*T. euchlora*). In nine cases out of ten the glossy linden is mistaken for the red linden, but the confusion has no justification. The two trees are distinct at least in the color of the bark, also in the aspect and texture of the leaf. The leaf of the red linden has sharp veins, an even crisp surface, and woolly tufts. The leaf of the glossy linden has a marked shine (hence the common name), bristle-like tufts, finely etched veins, and in almost all cases an uneven surface. In the glossy linden the bark is generally lighter or much

lighter than in the red linden and grayish rather than reddish-brown. *T. cuchlora* is not represented in the Garden, but is not rare in public parks and in gardens, and bobs up in all manner of surroundings in Prospect Park. The best specimen in the city, if the writer be correct, thrives half concealed by the horsechestnuts and the Paulownias just south of the George Washington Bridge on Riverside Drive. The glossy linden does not succeed in dry, poor soil: the two sorry trees that were planted before 1903 at the entrance of Central Park at West 96th Street are left at mid-August with few if any leaves, and have grown yearly by only fractions of inches.

The basswood (*T. americana*) requires but passing mention. Everybody has seen it wild and planted, but not everyone realizes how much its leaves can vary. Some trees exhibit large blades that are yellow-green and easily torn to shreds; other trees have small, dark-green, firm blades. Although the leaf of the species has normally many small tufts and is otherwise hairless, certain trees in Prospect Park have tuftless leaves, and one young specimen in Central Park shows sparse hairs not unlike those of *T. platyphyllos*. In cultivation only the small-leaved form of the basswood is satisfactory. The large-leaved form is ungainly and of coarse aspect. In New Jersey the basswood has been used to line avenues, but the planting looks more effective in June than in August.

The gray linden (*T. neglecta*) is closely related to the basswood, and is another tree both native and planted in the Garden. The gray linden deserves its common name but is manifestly distinct from the basswood only when the leaf unfolds and shortly thereafter. At that time the blade is more or less thickly beset underneath by star-shaped and simple hairs (the latter always less numerous), which cause it to appear whitish or grayish. So little hair, however, is left at the end of the summer that a magnifying glass is needed to spot it. The fruit of the gray linden varies a great deal, but is seldom as round and as hairy as that of the basswood. The basswood and the gray linden have the same limited value in horticulture and may be considered equivalent. They are always confused, in fact, with the result that the gray linden, a species little known even to the botanist, is fairly common in the parks of the City.

The gray linden, the bee-tree (*Tilia heterophylla*) and Michaux's

linden (*T. Michauxii*) may in a sense be considered forms of the same species. Michaux's linden is a gray linden with thicker and more persistent hair and a rounder fruit. The bee-tree is a Michaux's linden that has light brown tufts which appear when the leaf unfolds or immediately thereafter. The limits of these species are not clear. One may surmise that when our lands were covered by glaciers creeping in from the north the ancestor, or the ancestors, of the three lindens shuttled back and forth, and underwent changes that in the long run scrambled all the characters which the student of plant life is accustomed to look for in "good" species. The bee-tree does not grow in the Garden, not at least in the form true to the description given by Ventenat, the "father" of *T heterophylla*. A good specimen of the species as described by Ventenat stands at the south of Morningside Park, close to the wall that runs along Cathedral Parkway. (Morningside Park, by the way, deserves mention as the harbor of the single true oriental plane, *Platanus orientalis*, that grows on public grounds in New York City.) Three mature plants of Michaux's linden manage to survive at Riverside Drive, about at the level of 103rd Street, and young specimens live in Central Park. Trees which are probably wild are recorded for Fort Washington Park.

The so-called Moltke or greenish linden (*T. spectabilis*), a hybrid of the basswood with the silvery linden (*T tomentosa*), has tripped many an otherwise learned botanist. The difference between the two must be acknowledged as trifling indeed, and to be understood once forever it should be observed on trees that grow side by side. The greenish linden has many qualities of the silvery linden—the color of its leaf, its lack of tufts, its fruit; but the influence of the basswood shows in everything. Thus the blade is larger than in the silvery linden and is often cut slantwise at the base; the hair is scantier, the petiole is longer, the flower and the fruit are not so small. The greenish linden is fairly common in cultivation. About two dozen trees have been used in Prospect Park, mostly near the greenhouse at Ninth Street and Prospect Park West. One specimen stands in Central Park almost facing the music stand on the Mall.

Two other hybrids of the basswood have been planted in the parks of the City, but, like the greenish linden, neither is found in the Garden. One, the flabby linden (*T flaccida*) is the offspring of *T americana* and *T. platyphyllos*. The other, the flower-

ing linden (*T. floribunda*) arose in the combination of *T. americana* with *T. cordata.*

The flabby linden openly acknowledges its mixed ancestry: it resembles both its parents, and the horticulturist who plants it learns in the long run that it has the drawbacks of both. Its habit is irregular without being pleasing, its leaves are apt to fall early, its resistance to drought is most limited. A few samples of this linden, planted, it may be assumed, for *T. americana,* live in Riverside Park between the levels of 116th and 119th Streets, along the walk at the foot of the retaining wall.

The flowering linden is a bird of different feather, a clean-cut tree which, but for its weeping habit and large leaves, brings to mind the red linden. Its flowers hang in long slender clusters, and are about as large as those of the basswood and as dainty as those of the small-leaved linden. Only one tree grows in Prospect Park with the greenish lindens that are planted east of the greenhouse mentioned above.

The silver linden (*Tilia tomentosa*) and the silver weeping linden (*T. petiolaris*) are found in the Garden in a group in which two specimens of the former are the largest trees in the collection. Both of these lindens are native of Europe, particularly of the Balkans. The difference between them in the main is a matter of the fruit and of the length of the petiole. The silver weeping linden has a whiter, less pointed, less sharply ribbed fruit, and petioles that are always longer than half the blade (hence the "weeping" habit of the leaves). Except for these points the two species are very similar: in both the bark is smooth and grayish, the blade dark-green above and silvery underneath, the young growth more or less thickly covered by flat-lying, star-shaped hairs.

Tilia tomentosa is extensively cultivated, and is one of the best lindens for planting in cities. It is liable to injury from frost, and the trunks of the majority of specimens in our part of the country plainly show the bite of winter. The tree, however, is never "killed" at the branches, and its resistance to drought fully compensates for its tendency to being tender at the main stem. Large silver lindens are standing near the Zoo and elsewhere in Prospect Park.

Tilia petiolaris is unfortunately not common. Under cultivation it is as reliable as *T. tomentosa*, and more graceful. Two superb

specimens thrive in Prospect Park, one in the small lawn west of the Litchfield Mansion. Several otherwise good plants scattered in Prospect and in Central Park have been spoiled by unintelligent grafting: the stock is *T. cordata* or "*T. vulgaris*," which grows less rapidly than the scion. With high grafts the trunks are marred by unsightly rings, which easily could have been avoided by budding low.

The Asiatic Lindens are practically unknown in our city. The numerous Japanese, Korean, Chinese, and Mongolian species will contribute in time, no doubt, to the wealth of our collections and to the beauty of our gardens. Several peculiar lindens found in southern China are bound to be tender in our part of the country but will thrive from the Carolinas to Florida and in California.

The linden knows four main foes: drought, the "red spider" (*Tetranichus telarius*), the black mildew (fungi of the group *Fumago*), and the Japanese beetle. The first two go hand in hand, and can effectively be checked by irrigation and timely spraying. The black mildew does little damage beyond soiling the leaves of the trees it attacks. The Japanese beetle is hungry for lindens and is increasingly assuming the status of a first-class menace. Nothing promises to check the pest effectively except the so-called physiological control, which so far does not seem to have been achieved. Spraying with arsenate of lead still is a costly but necessary protection.

LEON CROIZAT.

PALMS AS INDICATORS OF THE MAXIMUM WATER LEVEL

In southern flatwoods[1] and about lakes and ponds where palms grow, the cabbage-trees (*Sabal Palmetto*) usually show a dense encircling cushion of aerial roots about the base of the trunk. In some cases this cushion is a few inches high, while in others it may extend three feet or more up the trunk. A novice viewing these objects is at a loss to account for the unusual root growth, but to one accustomed to the peculiarities of such country the solution is not difficult. The palm-trees do not normally grow in the water, but are often in places where water rises and remains about them during wet spells or flood periods. In times of dry

[1] Flatwoods are pine woods where the water-table is constantly near the surface of the ground or over the surface part of each year.

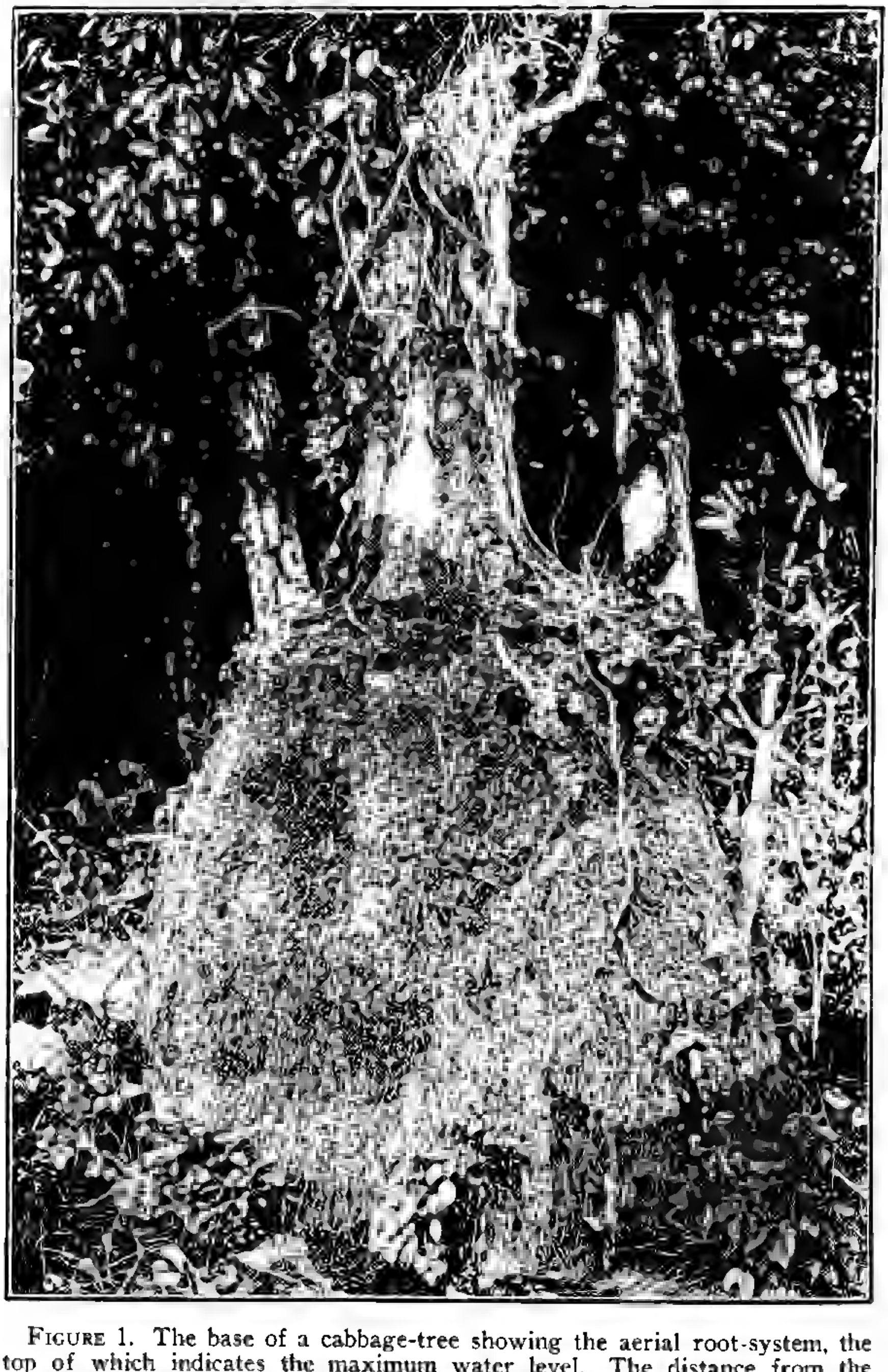


FIGURE 1. The base of a cabbage-tree showing the aerial root-system, the top of which indicates the maximum water level. The distance from the tree's anchorage in the sand to the top of the root-base is between four and five feet. The roots are aerial in dry weather, aquatic in high-water season.

FIGURE 2. The base of a Louisiana palmetto—*Sabal Deeringiana*—on the shore of Lake Pontchartrain, Louisiana. The palm stands in a swale where backwater from the lake and water from heavy rains stand for short periods. The floodwaters remain long enough to encourage the palm to send out a series of roots, the upper ones indicating the maximum water level.

weather one might well wonder about the origin of these dense cushions of aerial roots encircling the palm trunks.

Some of the palms are vigorous growers. The cabbage-tree, for example, responds rapidly to surrounding conditions, as well as accommodating itself to almost any habitat, favorable or unfavorable. Certain palms have, by their experiences through the ages, acquired the ability to develop roots under little provocation. So, when the water rises above the surface of the ground, the palm in its desire to continue or accelerate its growth starts a new set of roots at the base just beneath the temporary high water level. The roots come out in great numbers and are packed to-

FIGURE 3. The lower part of a trunk and part of the root-system of a fossil palm—*Palmoxylon* sp. –from near Natchitoches, Louisiana. Curiously enough, this specimen shows that the same habit of developing adventitious roots existed among the Louisiana palms in geologic times.

gether very tightly. They are exceedingly tough cord-like or rope-like structures, each with a thimble-like protective cap at the apex. When the water recedes for a time this mass of roots is exposed to the air and resembles a cushion with myriad nipples. With the next flooding the roots become active and add growth to the former accumulation.

An examination will show that the cushions extend higher on the trunks that stand in the lowest spots. Should an observer be present during a high water period he will notice that the water reaches exactly to the top level of all the cushions. So, it would be quite evident that the root-cushions are the result of the palm sending out short aerial roots during periods of floodwaters. To build a house or make a garden below the level of the tops of these root-cushions would obviously be a mistake—though many builders, apparently, have never learned this lesson.

The figures from our collection of palm photographs illustrate the condition involved. The cabbage-tree (*Sabal Palmetto*) in FIGURE 1 is on the shore of Lake Okeechobee, Florida. The fluctuation of the lake-level is often great, being caused indirectly by the rains in the drainage basin and the damming up of the outlets. The cushion of roots in this case indicates about four feet in height. The Louisiana palm (*Sabal Deeringiana*) in FIGURE 2 is on the shore of Lake Pontchartrain, Louisiana. The fluctuation here is not great and is the direct result of rains over and about the lake.

Louisiana in past geological times had a much larger palm flora than it has at present. About six species of fossil palms have been described from within the limits of the state. The palms in those ancient times had the same habit of producing aerial roots, as is evidenced by the fossil specimen shown in FIGURE 3. This is a pretty close duplication of the base of the living species shown in FIGURE 2. The fossil palms in Louisiana are found largely in the northwestern part of the state.

JOHN K. SMALL.

THE ALPHONSO WOOD HERBARIUM

Few botanists are now living whose early studies were pursued under the influence of Wood's "Class Book of Botany," largely used in the seventies, when I began my work. This was emphatically the work of a field botanist, for Dr. Wood was indefatigable

as a collector. He was also an active correspondent, and exchanged with nearly all the botanical collectors of his time. Becoming professor of botany in the College of Pharmacy of the City of New York, he secured time and facilities for carrying on his botanical work that he would not otherwise have had.

On one occasion, when I spent the afternoon in his company, he gave me an account of the circumstances and considerations that led him to undertake the writing of his book. It is sufficient to say that his motive was not so much that of personal interest as a feeling that the identities and relations of the plants discussed were not being accurately presented in the books then in use, and a desire to make them known as they appeared to him in the living state.

When Dr. Wood died, he bequeathed his herbarium to the College of Pharmacy, where it was greatly neglected for many years. When the Canby Herbarium was purchased, many of Wood's specimens were collected from drawers, closets, boxes and bundles, where they had been scattered, and were placed in the Canby cases. It was evident, however, that these specimens represented but a part of the Wood Herbarium. Botanists who came to consult them or who wrote for information were unable to find what they were seeking and we received many expressions of disappointment. Because of this obviously fragmentary state of the Wood collection, no serious attempt was made to segregate and arrange it until about two years ago, when we came, in an unexpected place, upon several cases containing specimens of this collection. I then began the segregation and arrangement of the entire Wood Herbarium, a work to which I have since devoted my spare time. The classification and nomenclature have been made to conform, for the most part, with that of the Canby Herbarium, and the whole should be subjected to a process of modernization.

By the present arrangement, all specimens of the Wood Herbarium are enclosed in one or more covers at the end of the genera to which they respectively belong, each cover bearing a label, "Alphonso Wood Herbarium," in heavy capitals. The genera in each family are arranged in alphabetical order, so that any specimen can be found promptly. It is an unfortunate fact that an occasional specimen that he is known to have collected cannot be found.

During the progress of this work, some interesting facts have come to light. The last important collecting done by Dr. Wood seems to have been along the Pacific Coast and on his journey there and back. He appears to have traveled with scanty facilities for collecting, most of his specimens having been made as small as completeness would permit (some of them too small), but they are well preserved and mostly characteristic. Comparatively few of them are named, as his death occurred before he had an opportunity for studying them. It is to be hoped that someone familiar with the Pacific Coast flora will undertake the determination of this part of the collection. The same is to be said of a considerable number of specimens from the mountains of Kentucky and Tennessee.

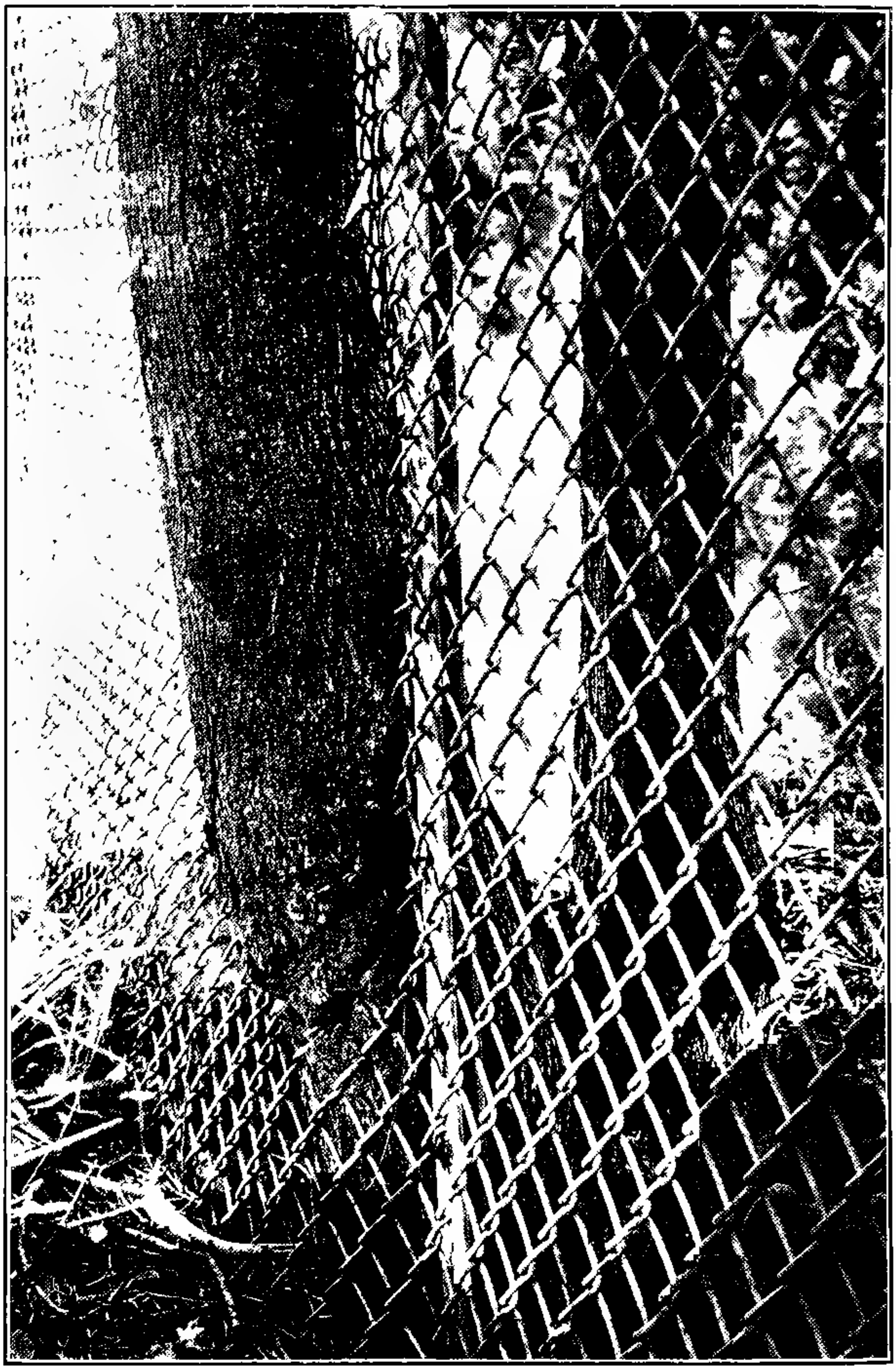
It appears further, from the material that we find, that at the time of his death, Dr. Wood was engaged in a number of special studies, notably of *Carex*. He had collected these plants in heavy duplication and appears to have been preparing them for exchange purposes. The same may be said of his collections of mosses.

H. H. Rusby.

A BISECTED TREE WHICH FLOURISHES

A tree which bisected itself and lived to tell the tale has been found on the grounds on the Astoria gas plant of the Consolidated Edison Company of New York. With some 350 square inches of heavy wire fence embedded in its trunk, this tree, reported to be a slippery elm, continues to grow and flourish. The fence—a cyclone type, nine feet high—also has withstood the unusual condition, and stands as straight today as the day it was erected.

Some twelve to fifteen years ago the tip of the young tree inserted itself in one of the meshes of the fence. It looked like arboreal suicide to observers. Undismayed by its wire entanglements, however, the sapling continued to grow until today it stands some 25 feet high. The distance from the point at which the fence emerges from the trunk at the top to the place of emergence at the bottom is approximately 30 inches. The tree is 17 inches in diameter at the base. It grows up some 17 inches, then branches into two sections. The trunk bisected by the fence is 12 inches in diameter and the other is 7 inches. See the illustration on the following page.



A bisected tree which continues its growth without apparent injury at Astoria, New York.

PLANTING NOW FOR SPRING GARDENS*

With a Selection of Good Narcissus Varieties

Good gardeners consider several things when they plant, whether it be bulbs, herbaceous plants, shrubs or just seeds. The most important thing is what will grow well in the space available. First we must see what kind of soil we have, how deep it is good, and note the exposure; that is, whether it will be sunny, semi-shaded or shaded and if there are adjacent trees. Large trees will naturally shade the ground later in the season, but we can often put under them some plants that will give pleasure early in the spring before the leaves come out.

For this purpose some of the small bulbous plants such as snowdrops (*Galanthus nivalis*), the Siberian squill (*Scilla sibirica*), the snake's-head fritillary (*Fritillaria meleagris*), and winter-aconite (*Eranthis hyemalis*) may be combined with such ferns as Christmas fern, which is green all winter; wild maiden-hair fern, which comes up in springtime and dies down in autumn; epimediums, low plants with heart-shaped leaves reddish on the margins; or a sedum that will stand shade such as *Sedum sarmentosum*. These are all satisfactory under trees.

We will take it for granted that we have looked about our gardens last spring, that we noticed where there were suitable places for spring-flowering bulbs and that we have gone to the spring flower shows and to specialists' gardens and made a record of the varieties we desired to add and the quantities necessary. If we are forehanded, we will have ordered the bulbs before the end of June. They will probably be delivered to us at the end of August. If we are not ready to plant them when they arrive, the bags should be opened and set in a well-ventilated, dry place free from rats or mice.

Daffodils and the various other small bulbs should be planted as soon as possible after they come so they can make good root growth before frost hardens the ground. In preparing the ground, do not allow manure to be mixed with the soil so that it comes in contact with the bulbs. I have found dried sheep manure good to use. I dig the ground well and mix a handful of sheep manure

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* An address given by the Honorary Curator of Iris and Narcissus Collections at The New York Botanical Garden, before the Radio Garden Club of the Agricultural Extension Service, Rutgers University, over Station WOR, September 11, 1936.

with the very bottom soil in a trench or patch—say two inches of loosened soil. Then I add two inches of soil without manure, placing the bulbs on this, and I mix some wood-ashes with the topsoil that covers the bulbs. This treatment is for exhibition bloom or for very poor ground. In ordinary good garden soil I use no fertilizer at all.

Regarding depth to plant, I might add that most bulbs must be covered once and a half their own depth from the bottom of the bulb to where the neck begins. Remember this rule and you will have a safe guide, as bulbs vary in size. If you are planting the very small ones, such as snowdrops, in a patch—and they look best this way -take out the soil to the proper depth in the shape patch you want and place the bulbs. Then cover them carefully with the soil. You can scatter tiny bulbs, as they do not mind being on their sides and will right themselves in a year's growth. Tulips are best planted between the middle and the end of October.

Do not mulch bulbs until the surface of the ground is frozen hard. This is to keep mice out. The mulch keeps the ground frozen, then, all winter. It is for protection, and the best mulch for bulbs is very well-rotted manure, because it acts as a fertilizer as well. Lacking this, salt hay is good. Some people use excelsior. When leaves are used, they must not be very thick. Make a simple rough plan of where you have put your bulbs and keep this plan where you can find it easily next spring; then bring it out and label the plants. Labels put in beds in autumn get broken or lost under the mulch or heaved out by frost.

In choosing bulbs try to know the varieties you want, and buy from well-known, reliable dealers so that you will get things true to name. Spend your money on a few good varieties rather than on a lot of trash which you will be throwing away later on. This is especially necessary with daffodils. Nothing repays the gardener more than a few of the better varieties. A good selection would comprise some trumpet varieties—white, bi-colored, and yellow; some short-cupped—both all yellow and bi-colored (yellow and white or yellow with red or reddish cups); some flat-cupped varieties of the various color groups; some of the white or *Leedsii* group; some *poeticus;* some bunch-flowered; some double and some smaller, shorter sorts for the front of the border or rock garden.

There are many types, heights, and sizes in the eleven groups

and their sub-divisions, making hundreds of varieties to select from, so there is some variety suitable for everyone's taste and purpose as well as for each pocketbook. Price, however, is based on rarity, not on quality. One must try to know the good sorts and get them, perhaps waiting a few years until a coveted gem has increased enough in quantity to come down in price.

We all know the old trumpet variety, Emperor. This is still good, and so is Olympia. King Alfred we see often at shows, but Golden Harvest is better and more reliable, while Mme. van Waveren is very large and satisfactory. A more dwarf pale-yellow trumpet is Harvest Moon. This combined with a white or lavender *Phlox subulata* or with forget-me-nots makes a delightful picture. One of the earliest of the large, yellow-short-cupped or *incomparabilis* daffodils is Helios. This and Henriette are both excellent. For later, I like Lucinius and Wheel of Fortune, rich gold and perfectly round flowers which hold their heads up nicely.

Orange Glow is one of the newer, more sensational daffodils that repays an investment, as is Red Cross. Both of these are very large flowers on tall stems, one with a frilly cup, the other plain. Red Cross is good in the garden, as the color in the outer petals (the perianth) does not fade. Red-cupped varieties are usually better if placed where there will be a little shade part of the day, because our sun is so hot. Croesus, of the flat-cupped or *Barrii* group, is still worth while. This is a pale yellow with the cup flushed orange. In the flat section of the *Leedsii* a beauty is Mitylene, which is a very good grower, increasing rapidly, as nearly all the new kinds do. Tenedos is a handsome white giant *Leedsii*.

My favorite double daffodil is Cheerfulness, which comes late and is white and yellow, always blooming well. There is another startling double called Mary Copeland, white with red center, a huge flower on a long stem, and there is a double white named Daphne that blooms better than the old gardenia-flowered variety. There are hardy bunch-flowered sorts, but those we see in the stores for forcing in water are usually kinds that would not stand our New York winters. Haemon, white and yellow; Thalia, white; Fair Alice, golden, and February Gold, a deep gold, are fine. These are all short, not more than 14 inches high at most.

Whether it be daffodils or crocuses, scillas, tulips or hyacinths, always feel the bulbs to see if they are firm. Should any be soft

or slimy, burn them. They would not grow anyway, and they might bring disease into your garden. Do not buy mixed bulbs. The effect will be bad, for they will not all bloom at the same time. Plant in groups or drifts, trying to get a definite effect and planning it beforehand. What is planted in autumn is done with hope and imagination of spring pleasure; in fact, all gardening has this basis and the results are a thousand unexpected joys.

ETHEL ANSON S. PECKHAM.

A GLANCE AT CURRENT LITERATURE*

Daffodil enthusiasts who are interested in the foreign varieties which may be made available in this country before long will welcome the report of the trial gardens of the Royal Horticultural Society at Wisley, England. While the behavior of plants in England does not necessarily indicate what they may be expected to do in America, the descriptions give a fair evaluation of each variety over a three-year period. The report appears under the title, "Narcissi at Wisley, 1934-36," in the July *Journal of the Royal Horticultural Society*.

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The recent work of Dr. Michael Levine at Montefiore Hospital in New York is explained in an article, "Plant Tumors and their Relation to Cancer," appearing under his name in *The Botanical Review* for September.

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The results of a special study, conducted since 1921 on one of the largest genera of orchids, has been recently published by the Botanical Museum at Cambridge, Mass. It is "The Genus Epidendrum in the United States and Middle America" by Oakes Ames, F. Tracy Hubbard, and Charles Schweinfurth. Two hundred twenty-nine species of *Epidendrum* are designated.

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"Native and Exotic Palms of Florida" is the title of Bulletin 84 of the Agricultural Extension Service at Gainesville, Florida. The 70 pages, prepared by Harold Mowry, are profusely illustrated.

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* All publications mentioned here—and many others—may be found in the Library of the Botanical Garden, in the Museum Building.

Her two-year adventure in locating wild dahlias in Uruapan, Michoacán, Mexico, is told by Marion Storm in the May *Bulletin of the American Dahlia Society*. Dahlia seeds which she sent to The New York Botanical Garden two years ago produced flowering plants in the dahlia border last year and again this fall. The flowers are called "charahuscas" in Mexico, she says.

* * *

"Not more than three seed-pods should be allowed to ripen on a plant," declares Isabella Preston in writing on "Growing Lilies from Seed" in the September *Flower Grower*. Miss Preston is a specialist at the Dominion Central Experiment Farms in Ottawa, Canada.

* * *

In the 1936 *Yearbook of Agriculture* of the United States Department of Agriculture, which contains 1,200 solidly printed pages, a bird's-eye view is given of the Government's work in plant breeding, notably with wheat, barley, oats, rice, corn, sorghum, sugar-cane, sugar beets, cotton, flax, and tobacco.

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"A Study of the Soil" by G. R. Clarke of the University of Oxford is a miniature volume of 142 pages, describing how a scientific study of the soil of a given site is made.

CAROL H. WOODWARD.

NOTES, NEWS, AND COMMENT

The collection of plants of Hainan, sent to The New York Botanical Garden by Sun Yatsen University, China, for identification by Dr. E. D. Merrill when he was Director here, has now been divided into 15 sets, numbering from 900 to 1,500 specimens each, which are being sent out in exchange to institutions in many other parts of the world. Dr. Merrill completed the naming of the specimens on week-end visits to New York after commencing his new work at Harvard University.

* * *

Dr. Lewis E. Wehmeyer of the University of Michigan spent several days recently in the Mycological Herbarium of The New York Botanical Garden studying certain groups of fungi.

Stopping in New York on their way back to England, Will Ingwersen and J. R. G. Drake, horticulturists and plant collectors, visited the Botanical Garden after a trip through western United States.

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Another recent visitor to the Garden was Samuel Higbee Camp of Jackson, Mich., who has been in New York exhibiting the "transparent woman" at the Museum of Science and Industry in Rockefeller Center. Forty years ago, Mr. Camp was an occasional contributor to botanical literature, and his works are contained in the Library of the Botanical Garden. He has a private herbarium of 3,000 specimens, collected in Michigan and in places where he has traveled.

* * *

The following visiting botanists have enrolled in the library during the summer:

Dr. E. D. Merrill, Cambridge, Mass.; Mr. Don B. Creager, Boston, Mass.; Dr. Gertrude S. Burlingham, Newfane, Vt.; Prof. H. H. Whetzel and Mr. M. C. Richards, Ithaca, N. Y.; Prof. Edgar T. Wherry, Philadelphia, Pa.; Dr. Edward H. Graham, Pittsburgh, Pa.; Prof. Orland E. White, University, Va.; Prof. F. A. Varrelman, Prof. M. A. Raines and Dr. Miriam L. Bomhard, Washington, D.C.; Mr. John V Watkins, Gainesville, Fla.; Prof. L. R. Hesler and Prof. Stanley A. Cain, Knoxville, Tenn.; Dr. Ernst J. Schreiner, Norris, Tenn.; Dr. Dorothy Parker, Cincinnati, Ohio; Prof. L. E. Wehmeyer, Ann Arbor, Mich.; Prof. C. Mervin Palmer, Indianapolis, Ind.; Mr. C. Y. Chiao, Madison, Wis.; Prof. H. E. McMinn, Oakland, Calif., and Dr. Frans Verdoorn, Leyden, Holland.

* * *

Asiatic garden beetles are most effectively trapped by a blue light inserted in a funnel containing four wings at right-angles and leading to a glass jar from which the beetles cannot escape, once they have fallen in. Where other bright lights interfere, a G-5 mercury vapor light, which requires a special socket, is found most effective; otherwise a 100-watt blue daylight bulb will attract the beetles, government investigators have recently reported.

A gold medal "For Service to Dahlia" was awarded to Dr. Marshall A. Howe at the annual dinner of the American Dahlia Society at the Pennsylvania Hotel September 23. The presentation was made by George W. Fraser, president of the society.

* * *

Dr. Kiichi Miyake, professor of botany at the College of Agriculture of Tokyo Imperial University, Japan, spent September 25 at the Botanical Garden, after attending the Harvard Tercentenary celebration. From 1900 to 1902 Dr. Miyake studied at Cornell University, and visited this country again during 1910. Coming by way of Europe on his present trip, he is returning to Japan across the Pacific.

* * *

Dr. Frans Verdoorn, editor of *Chronica Botanica,* and also secretary of the botanical section of the International Union of Biological Sciences, spent several days at the Garden during September, after nearly three months of motoring over the United States, visiting bryological herbaria and meeting the American collaborators of *Chronica Botanica.* He is returning to Holland this month, after visiting botanical institutions in the eastern cities.

* * *

Henry Teuscher, who is now Superintendent and Chief Horticulturist of the Montreal Botanic Garden, returned to The New York Botanical Garden for a few days in September. Frère Marie-Victorin, Scientific Director of the Montreal Botanic Garden, joined him here September 28, and the two returned almost immediately to Montreal, carrying back many new plants for their institution. This new botanical garden, which is being developed according to plans drawn up by Mr. Teuscher, has recently had an appropriation of $200,000 for the construction of roads, a drainage system, and other features.

REVIEWS OF RECENT BOOKS

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

Into The Green Growing Forest

. . . "This is the story of man facing his world—man in his nakedness, abstract curiosity glittering in his simian pupils as he stares at the wall of the primeval wood and listens to its sounds, and wonders." . . .

Donald Culross Peattie's latest book[1]—Green Laurels—is a treatise on intellectual curiosity, yet it is so much more that it defies pigeon-holing. It is not a series of biographies—fortunately; for I am not interested in where Linnaeus spent the 16th day of June in 1752; I want to know the man himself. Peattie has given us such an insight, for he has not been content merely to give us a description of Linneaus' field trips with his students, but has taken us along, and for a brief time we are a part of the world of Linnaeus, and think his thoughts; we stand with Bartram on the banks of the Alatamaha[2] and view for the first and last time in the wild the almost fabulous *Franklinia*; we sit by the side of Wallace that hot feverish night in Ternate when he dreamed the dreams that prodded Darwin into publishing his theories of evolution: from Aristotle to the moderns, we join for a while the procession of men who have molded the destinies of biology.

There are some among us going up and down the world, shouting of the heroes of biology, cloaking a lack of understanding with exclamation points. These men have been called popularizers of science, but the phrase is a delusion. Biology has come of age and we can dispense with the tub-thumpers. What the science needs is an interpreter, and Peattie today stands almost unique in this role, for of all who profess, he alone has taken the time to learn the language and to perfect the idiom.

In some ways Green Laurels is a remarkable book—to me a more solid, a better written, and a more readable book than his very delightful Almanac for Moderns; for although crammed with anecdote it is not a book of personalities, but rather a stimulating and lucid presentation of the spirally expanding universe of biological thought.

In a time when the world's indecision and discontent are penetrating our thinking and clouding our conclusions, it is well to

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[1] Peattie, Donald Culross, Green Laurels. 368 pages, illustrated. Simon & Schuster, New York, 1936. $3.75.

[2] Spelled *Altamaha* today.

know this book. We are fortunate to have Peattie, not so much to entertain us, not so much to teach us, but to chide us for our indecision, to cheer us from our discontent, and lead us back into the green growing forest.

W. H. Camp.

Rafinesque and His Friends

Ninety-six years ago Constantine Samuel Rafinesque, "Prof. of Historical and Natural Sciences, Languages &c., member of 16 Learned Societies in Europe and America, author of 220 Works, Pamphlets, Essays and Tracts", died in poverty in a Philadelphia garret. He died alone, deserted by his few friends, but he is not forgotten. The remarkable details of his tragic life have been many times retold, and are probably better known to the scientists of today than those of the lives of any of his contemporaries.

It is only five years since the publication of James Whaler's 147-page epic "Green River: a Poem for Rafinesque", relating in fanciful verse some of the outstanding events of his life. The incidents are of course fictitious, but a sympathetic portrayal of Rafinesque's character stands out on every page.

And now we have a new contribution to the growing list of Rafinesquiana, under the title "Rafinesque's Kentucky friends."[3] The occasion for this small volume is the reproduction for the first time of twenty-five pencil sketches by Rafinesque, showing his idea of the personal appearance of certain of his friends and acquaintances. A few were certainly drawn from memory, but most were from living models, with or without conscious posing. To the writer of this review they appear to possess little or no artistic merit; they might almost be termed caricatures. Yet they deserve to be cherished, if only as evidence of a hitherto unknown whim of the many-sided genius. More than twelve pages are taken up with an admirably condensed biography of Rafinesque himself, which serves as a background for the sketches with accompanying text that follow.

In view of the fact that the entire volume, including several blank pages which have been counted in numbering, comprises only 71 pages, it is difficult to justify either the smallness of the edition (150 copies) or the largeness of the price (more than ten cents per page per copy). The price seems to have been set with a view to prevent the sale of the entire edition!

Rafinesque's mother was referred to in his autobiography merely as "M." Schmaltz, and her baptismal name seems hitherto never to have appeared in print. The sketch of her, however,

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[3] Weiss, Harry B., Rafinesque's Kentucky friends. 71 pages. Privately printed, Highland Park, New Jersey, 1936. (Heartman's Historical Series No. 49.) $7.50. (Copies may be purchased from Harry B. Weiss, 19 North 7th Ave., Highland Park, New Brunswick, N. J.)

drawn from memory, and reproduced on page 27 of this work, was boldly lettered in full capitals by the artist "Madeleine Schmaltz". (Her family was German, and this name was probably originally Magdalena, translated into French after her marriage to Rafinesque's father.) Why the name should appear twice on the opposite page as "Madeletne" is incomprehensible. The "I", to be sure, looks a little like a "T", but it is not like the "T" in Schmaltz, while it precisely matches the "I" of Isaac below the preceding portrait. "Madeletne" is as unreasonable as "Tsaac" would be. The portrait says that she was born in "Constantinople"; page 7 says, following previous writers, that she was born in "Greece"; page 26, facing the portrait, says that she was born in "Constantinople, Greece"! Doubtless the fact is that she was born, as was her son, in the Greek quarter of Constantinople.

The writer has discovered nowhere between the covers any hint of the history of the sketches, or of their present location or ownership. They bear abundant evidence in themselves, however, of their genuineness. To these few and relatively unimportant criticisms, we may add that the book is remarkably free from clerical and typographical errors.

J. H. BARNHART.

SEEDS—AND FRUITS

The hours which Mr. Quinn spent preparing his book on seeds,[4] must have been delightful, for the volume is filled with facts and quotations of the sort which catch one's fancy and tempt one to read for hours when glancing through old herbals, books of travel, and other sources of nature lore. The snatches of information with which it is crammed have been gleaned from all ages of man and all sections of the earth. Occasionally the authority for a quotation is given. Many readers would welcome more frequent reference to sources.

The decorative illustrations which are scattered through the text, as well as the reading matter itself, actually deal more with fruits than with seeds. In fact, the author confesses in his introduction: "To avoid confusion, 'seed' is used in the title, and occasionally elsewhere, to indicate what is botanically the plant's fruit." Perhaps nature students, who will undoubtedly enjoy this book, will understand the purpose, but it seems curious and hardly acceptable admittedly to call a seed a fruit and a fruit a seed.

There are chapters on shapes of seeds (and fruits), on how seeds travel, what they have been used for through the ages, poisonous seeds, edible fruits and nuts, and superstitions concerning seeds.

CAROL H. WOODWARD.

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[4] Quinn, Vernon, Seeds: Their Place in Life and Legend. 188 pages, illustrated. Frederick A. Stokes Company, New York, 1936. $2.

PUBLICATIONS OF THE NEW YORK BOTANICAL GARDEN

An Illustrated Flora of the Northern United States and Canada, by Nathaniel Lord Britton and Addison Brown. Three volumes, giving descriptions and illustrations of 4,666 species. Second edition, reprinted. $13.50.

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pages and 601 figures. 1932. Price, $5.50 postpaid.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages. 1935. $1.65.

Flora of Bermuda, by Nathaniel Lord Britton and others. 585 pages with 494 text figures. 1918. $3.50.

A Text-book of General Lichenology, by Albert Schneider. 230 pages: 76 plates. 1897. $2.50.

Mycologia, bimonthly, illustrated in color and otherwise; devoted to fungi, including lichens, containing technical articles and news and notes of general interest. $6.00 a year; single copies $1.25 each. Now in its twenty-eighth volume. Twenty-four Year Index volume $3.00 in paper, $3.50 in fabrikoid.

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* * *

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The New York Botanical Garden is located in the Bronx, immediately north of the Zoological Park at Fordham Road, and at the south end of the Bronx River Parkway. It may be reached by local trains from Grand Central Terminal to the Botanical Garden Station (200th Street).

To reach the Garden by the Elevated and Subway systems, take the Third Avenue Elevated to the end of the line (Bronx Park Station); from the East and West Side subways, transfer from the Lexington or Seventh Avenue line to the Third Avenue Elevated at 149th Street and Third Avenue. By Eighth Avenue subway (Independent system) take a C or CC train to Bedford Park Boulevard (200th Street), then walk east to the Garden.

To come by motor from the city, drive north on Grand Concourse to Bedford Park Boulevard (200th Street); turn east on Bedford Park Boulevard and cross the railroad bridge into the Garden grounds.

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Some of the leading features of The New York Botanical Garden are:

Four hundred acres of beautifully diversified land in the northern part of the City of New York, through which flows the Bronx River. A native hemlock forest is one of the features of the tract.

Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

Gardens, including a new rock garden, a large rose garden, a perennial border, small model gardens, and other types of plantings.

Greenhouses, containing thousands of interesting plants from America and foreign countries.

Flower shows throughout the year—in the spring, summer, and autumn displays of daffodils, lilacs, irises, peonies, roses, water-lilies, dahlias, and chrysanthemums; in the winter, displays of greenhouse-blooming plants.

A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants; also historic microscopes.

An herbarium, comprising more than 1,800,000 specimens of American and foreign species.

Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

Scientific research in laboratories and in the field into the diversified problems of plant life.

A library of botanical and horticultural literature, comprising nearly 45,000 books and numerous pamphlets.

Public lectures on a great variety of botanical and horticultural topics, continuing throughout the autumn, winter and spring.

Publications on botanical subjects, partly of technical, scientific, and partly of popular, interest.

The education of school children and the public through the above features and the giving of free information on botanical, horticultural and forestral subjects.

The Garden is dependent upon an annual appropriation by the City of New York, private benefactions, and membership fees. Applications for membership are always welcome. The classes of membership are:

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JOURNAL
OF
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ON APPALACHIAN TRAILS
W. H. CAMP

VICTORIA CRUZIANA
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ASIATIC IMMIGRANTS IN THE BOTANICAL GARDEN —VI
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A GLANCE AT CURRENT LITERATURE
CAROL H. WOODWARD

NOTES, NEWS, AND COMMENT

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ON APPALACHIAN TRAILS

As I tossed the last bundle of equipment into the car and stopped for a moment to take a mental inventory of the parcels, the fountain in front of the Museum Building, dripping over the worn stones, sounded almost like a mountain brook. It was 2:30 on a morning in May and a half-stillness had settled over the restlessness that is New York. Instinctively I looked up at the stars to be sure of my direction. There was Draco with all his contortions; and there the Great Bear pointed toward Polaris. All that was needed was to head toward the south and west, and sooner or later I would find the mountains.

That evening just as dusk settled over the land I rolled into Front Royal, Virginia. Ahead of me, deep in purple shadow, lay the Blue Ridge, and I said to myself: "Tomorrow I shall cross that range and head toward the part of Virginia that is wedged between Kentucky and Tennessee."

It was a well-meant resolve, but I had not counted on one thing —my weakness for azaleas.

The road from Front Royal over the Blue Ridge was not yet finished, so a lateral attack was made from Sperryville. As I topped Thornton Gap, the old car wheezing under a half-ton load of equipment, I saw a flash of rosy-pink on the mountain and turned left on the Skyline Drive to investigate. Soon the roadside was lined with this color, great masses of which extended on either side. It was Rehder's rose azalea (*Rhododendron roseum* Rehder). I parked the car and soon wandered into the woods. Under the shelter of Old Stony Man the pink mocassin-flowers and yellow ladies' slippers were in bloom and the alder thicket was alive with both the yellow and the white clintonias. Deep in a spruce thicket I heard a chickadee and saw the flash of a warbler's wing. It was spring in the Blue Ridge—and my passage

over the mountain lengthened into a day, and the day into a week; the weeks were multiplied—and it was not until summer had climbed out of the valley and was waving her golden banner from the summit of Hawksbill that I got myself, so to speak, down off that mountain.

The backbone of the Blues—now incorporated into Shenandoah National Park—is a high ridge with individual summits exceeding 4,000 feet in elevation. Rising to this height from valleys of 600 to 800 feet, it forms an imposing bulwark on the east of that great series of geo-wrinkles which for so many eons have held the eastern part of the American continental mass above the inundating waters of the unstable Atlantic and Gulf Coasts. To the southwest, a part of the same mountain system, lie the Great Smokies, that reservoir out of which has poured what is in some ways the most remarkable temperate-climate flora in the whole world—the flora of Eastern North America. Another important physiographic feature of this chain of mountains is that it runs, with but inconsiderable breaks, into the Valley and Ridge Provinces and the Appalachian Plateaus, the northern portions of which were glaciated. It is therefore not surprising that the Blue Ridge with its own flora has in addition many outlying stations of the unusual plants of the Great Smokies, as well as a fair representation of the more northerly plants.

In various ways the flora of the Great Smokies is peculiar, for it is an important outpost of the great Tertiary flora that originally spread from Asia. Many of the common genera contain nearly duplicate species in eastern Asia and in the mountains of Tennessee and North Carolina. There are also important links between the flora of the Smokies and that of the highlands of Mexico. The Blue Ridge was evidently one of the main highways of migration whereby the residual Tertiary flora spread northward.

With the advent of the Pleistocene and the slow accumulation of arctic conditions on the Canadian Shield, the Blue Ridge was soon to experience another migration, this time from the north. In fact, it was to feel the impact not of one wave of migration, but of a series of waves—for it is now well known that there were long periods, even during the late Pleistocene, when the glaciers of the eastern part of the continent retreated, only to advance again. These plant migrations from the north were not nearly so extensive as the earlier ones from the south, but they neverthe-

less contributed distinctive elements to the flora of the Blue Ridge. During the times that the northern parts of the country were chilled with great epi-continental glaciers, the upper slopes probably were covered with a dense stand of spruce and fir. But the climate changed, and more successful species crowded onto the

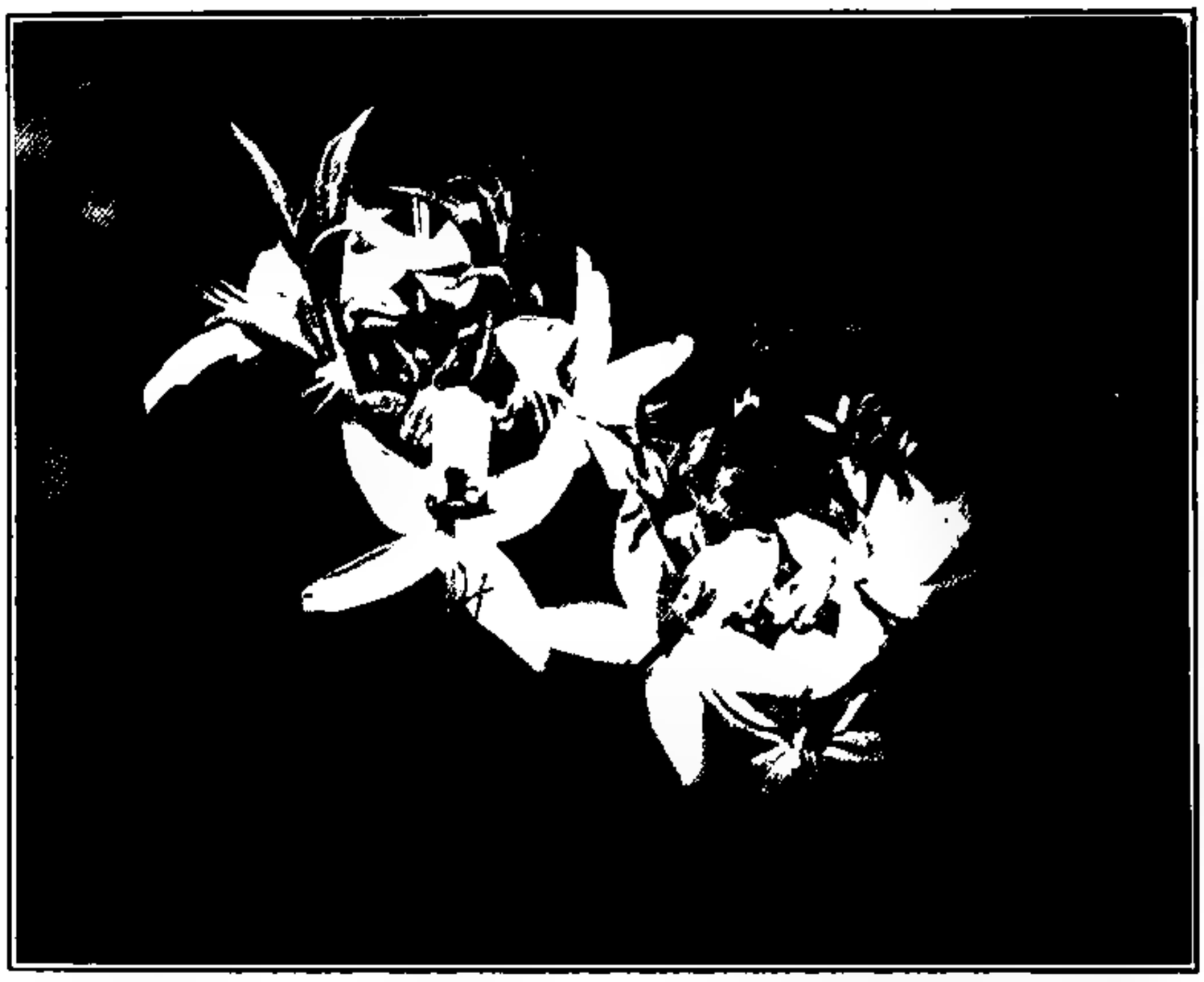

FIGURE 1. Rehder's rose azalea (*Rhododendron roseum*) in Shenandoah National Park, Virginia. The flowers are a rosy pink.

ridge tops from the sheltered valleys until today the spruce is limited to a few scattered stands and the fir reduced to a mere corporal's guard clutching grimly at the wind-swept edge of Crescent Rock.

Thus aware of the presence of certain remnants from a colder era, I was prepared for the three-toothed cinquefoil (*Sibbaldiopsis tridentata*), which ranges into Greenland, but I did not expect to find the dainty blue marsh bellflower (*Campanula uliginosa*) and others of our more northern plants.

It will be some time before the whole floristic story of the northern Blue Ridge can be told, for but few botanists have collected there. Then, too, the nature of the distribution of certain of the species makes it necessary that they be given a great deal of careful study. Here is a region with many of the plants in isolated colonies left behind from the various waves of migration

that have swept the ridge—small relic colonies which, due to a fortuitous habitat or some slight advantage in vigor or adaptability, have been able to maintain themselves against the competition of a more natural type of vegetation. Such colonies, isolated from their fellows and inbred for thousands of years, have given at least one phase of evolution a chance to assert itself. It is in the Southern Appalachians that the bulk of the plant species of eastern North America were evolved. In these same mountains new species will continue to be born.

* * *

The local common names applied to the plants of a region by its inhabitants have always fascinated me, and since one of the main reasons for the trip was to study the various species of blueberries, I soon learned that I was hunting "huckleberries" and not blueberries. In fact, it was not long until the mountain folk knew me as the "feller huntin' huckleberries" and one evening as I came down one of the trails past a cabin an urchin playing around the bare yard called out to me: "Hello, Mr. Huckleberry." Everywhere I went I made inquiries, for I was hunting a special "huckleberry"—one that grows on tall bushes. "Yep, they's lots o' them things on yander mounting," or, "Now, if ye'll take th' lead outer the Elkwallow an' foller up to th' ridge, ye'll come ter a plenty o' th' huckleberries yer a huntin'." Following their directions I found the low blueberry (*Vaccinium vacillans*) in abundance and its first cousins the true huckleberry (*Gaylussacia baccata*) and the deerberry (*Polycodium stamineum*). I even found the dwarf sugarberry (*Vaccinium angustifolium*) on the rocky top of Hogback Mountain. It was a day of jubilation, for this is the farthest south this plant has ever been collected. But I never found a plant of the high-bush "huckleberry."

I knew that high-bush huckleberries were common north of the Blue Ridge and I knew that they had been collected on the Blue Ridge to the south of the area where I was hunting them, and it was only reasonable to suppose that if I searched long enough I would find them. Finally I began offering rewards and hiring guides to take me to the places where they said they had picked them the year before. And each time the bushes were pointed out they proved to be something else. In this way I had an opportunity to build up a rather complete set of the native chokeberries (*Aronia*) and service-berries (*Amelanchier*), as well as an occa-

sional plant of other things. I soon learned that, to the native of the Blue Ridge, anything that grows as a shrub and bears a berry-like fruit that *can* be eaten is a "huckleberry."

On the last day I could spend on the Ridge, with the rain blowing through the trees in level sheets, I came across a rather bedraggled specimen of humanity resting in the lee of a rock. We hunched together and warmed ourselves as best we could with

FIGURE 2. The three-toothed cinquefoil (*Sibbaldiopsis tridentata*) growing along the top of Crescent Rock, Shenandoah National Park, Virginia.

certain comments about the weather. In our further conversation we found that we were both going over the mountain—he to hunt a job, I to hunt high-bush huckleberries. He scratched his straggled beard, looked at me pityingly, and said:

"Mister, you ain' gonna find high-bush huckleberries in these mountings hereabouts. Nothin' but the lows. Now if yuh wanna find th' high-bush huckleberry yuh better skin out an' go where I worked afore th' dee-pression come along an' I lost muh job. Why up neardt Elmiry, New Yook, whar I worked fer nigh ter twelve years, the bushes was so big in th' swamps thet yuh had ter bend 'em down to pick th' berries. An' lots of 'em too. Naw, they ain no sich thing here; if they was I'd of found 'em whilst I was still a tad roamin' over th' mountings."

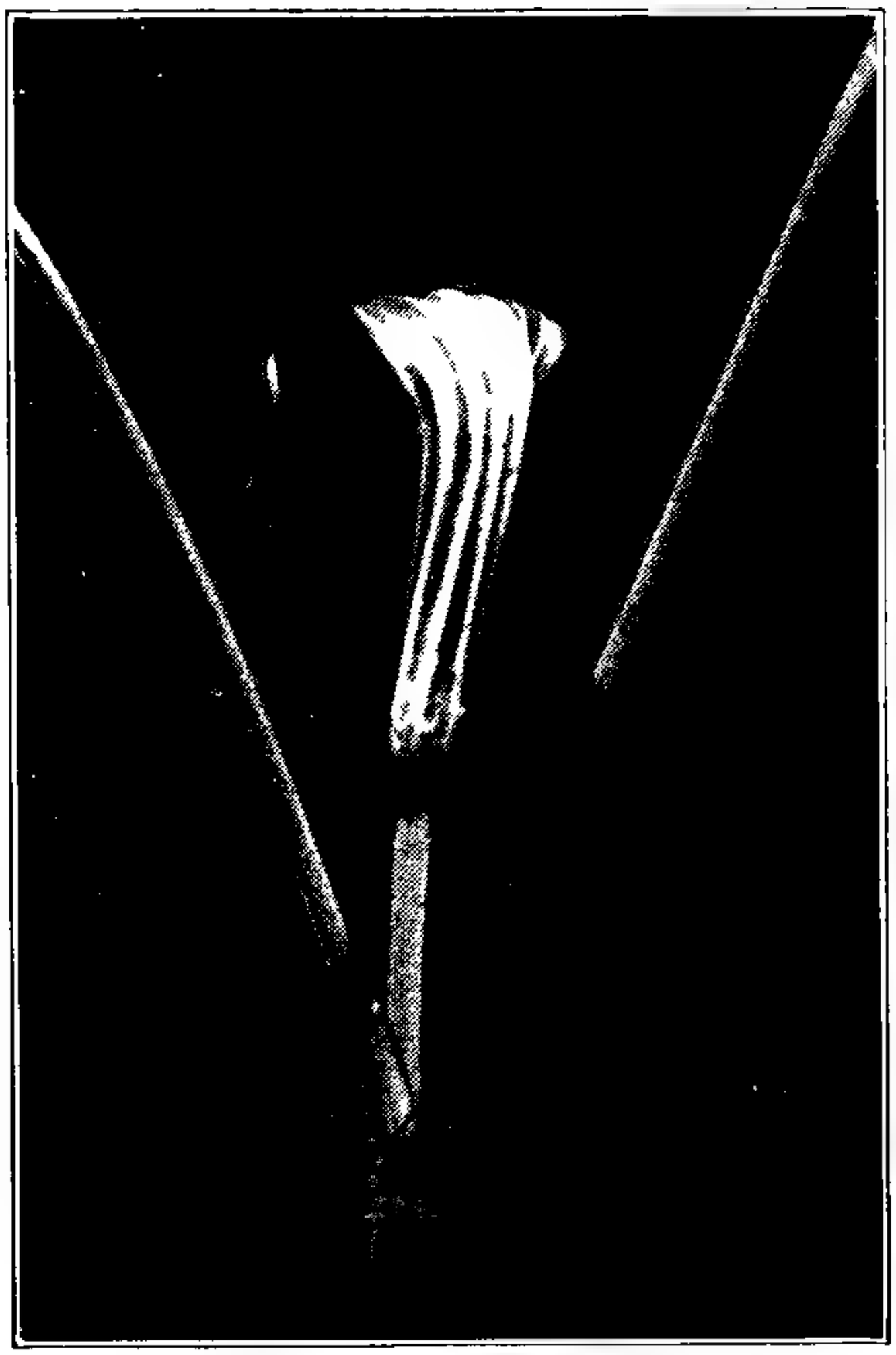

FIGURE 3. Stewardson Brown's Jack-in-the-pulpit (*Arisaema Stewardsonii*) from the bog in Big Meadows, Shenandoah National Park. This species is characterized by its deeply fluted spathe, which is often lined with white and green stripes.

Had I met the man weeks sooner, he might have saved me many a mile of weary and futile climbing. But I was not through with my paragon, for he soon told me of seeing a tree, with round leaves two feet across, growing in a certain cove about five miles distant. So off in the rain we went. Along the way I questioned him about this tree. "Weren't the leaves longer than wide?" "Nope," was his reply; "Nope, I picked one an' hung it up on th' porch. Th' leaves was purt-nigh round an' 'bout two feet acrost."

After a while we slithered and slipped down a poor trail and into a cove. Straight as a bee he took me to the tree and pointed up. There was perhaps a bit of chagrin on our faces for the leaves were *not* round—they were ten inches wide and two feet long—but I thanked him and he went trudging along, having done his bit for science. I sat on a dripping root, the water gurgling around my feet, and stared up at the tree. I was wet. I was hungry. And worst of all, my pipe was out and the old fellow had put my emergency supply of dry matches in his pocket and gone down the trail. I had collected in this same cove the previous week and my specimens of the umbrella-tree (*Magnolia tripetala*) had been taken from the very tree he pointed out to me. I am still wondering whether he really knew the difference between a high-bush and low-bush huckleberry.

For an antidote from the disappointment and the rain, I swung wide on the back trail and passed the spring bog in Big Meadows at the head of the Hogcamp Branch of Rose River. This little spot had yielded such treasures as Stewardson Brown's jack-in-the-pulpit (*Arisaema Stewardsonii*), the farthest south it has been collected. I was also going to find in the same moist spot at a later date the white bedstraw bellflower (*Campanula aparinoides*) and the blue marsh bellflower (*C. uliginosa*) growing side by side and learn that the white one often turns blue when pressed, while the blue one fades to a dirty white. It was here also that I was to find the trailing wolfsbane (*Aconitum reclinatum*) standing erect and the wild columbine (*Aquilegia canadensis*) six feet high. Will my bundle of specimens (as yet unnamed) from this place not bring me other surprises?

I wanted to stay longer in Shenandoah Park but I had a date with some red azaleas on Big Black in Kentucky and I was already a week late. This proved, however, not to be a serious matter, for the drouth, which seemed to be general throughout the southern Appalachians, was working in my favor. This year the azaleas were a week later than usual and I arrived at the height of the blooming season. (See the JOURNAL for July, 1936.)

From Kentucky I swung back into Virginia and headed for White Top Mountain and Mt. Rogers. There was a problem that had always puzzled me about these two peaks so near together. Mt. Rogers (5,719 feet elevation) is the highest point in Virginia and only a few miles from White Top, yet White Top is botani-

cally famous while one seldom hears of Rogers and sees but few specimens that have been collected on its slopes. Once on the ground the answer to the riddle was perfectly obvious. There is, and for a long time has been, a good road to the highest point on White Top, while no good road ascends the slopes of Rogers. It is a matter of walking, with the last part of the ascent through a thicket of lashhorn (*Picea rubens*). It was necessary to make five attempts before I was able to break through the thickets and gain the more rounded top. Coming down I stumbled onto a little-used trail which ended nowhere in a thicket near a meadow. Later I was to learn that one of the native herb doctors regularly once a year climbs Mt. Rogers to get balsam-gum. I had evidently stumbled onto his trail but the old fellow was clever and the bottom end had been concealed in a thicket.

It is interesting to note that the conifer on the very crest of White Top Mountain is the red spruce (*Picea rubens*) while the dome of Mt. Rogers is covered with both the red spruce and the southern balsam (*Abies Fraseri*). On White Top the spruce makes a magnificent stand of trees, while on Rogers it seems to be more stunted, forming the "lashhorn thickets" of the mountaineer.

On the slopes of these mountains one feels the strong influence of the Great Smokies, for many of the plants so characteristic of that range are also present here. The fir on Rogers, for instance, is the true southern balsam. [On Crescent Rock in the Blues, it is neither *Abies Fraseri* nor is it the northern balsam (*Abies balsamea*). Rather, it merits description as a separate species.] Here on the slopes of White Top and Rogers the umbrella-leaf (*Diphylleia cymosa*) is common, as are a host of other plants so abundant in the Smokies. Here grow the high-bush huckleberries in great profusion—and the natives know the difference between the "highs" and the "lows". Here too may be found the southern mountain cranberry. Studies in my laboratory some years ago on the anatomy of this plant showed without a doubt that it is not a *Vaccinium* as Michaux supposed when he found it. Neither is it a member of the genus *Oxycoccus*, as it was so classified by Persoon. In reality its nearest of kin is a species in Japan and Korea with a related and probably ancestral form in the mountains of China. Doctor Small therefore was correct in giving it a new generic name. Thus, our mountain cranberry (*Hugeria erythrocarpa*) joins that list of genera with species in our southern Appalachians and eastern Asia, and nowhere else.

FIGURE 4. Mt. LeConte (6,593 feet elevation) in the Great Smoky Mountains, Tennessee. This is the view of the mountain as seen from the west in Fighting Creek Gap at a distance of nearly eight miles.

The week spent here was a busy one, but in justice to the many botanists before me who have collected in this region, it must be stated that my bundle of specimens from White Top Mountain is much larger than the one from Mt. Rogers. But I'm still puzzling over those two azalea plants with large yellow flowers and ruffled corolla lobes margined with red that I found high on the slopes of Rogers. They were in bud and full bloom long after the other azaleas had passed.

* * *

The valleys of the Holston, Watauga and French Broad Rivers were panting under the heat of a late June drouth and dust whirled across the fields of Tennessee in the parching winds blowing up out of the southwest. In a sunset with great clots of red streaked across the horizon, I topped a rise in the road and saw to the south above the haze of high blue mountain valleys, the triple crest of Mt. Le Conte stabbing at the sky. It was like coming home after a long absence, for Le Conte is the first mountain I ever climbed.

They have made a National Park there and saved what is left of the region from the wanton hands of the lumbermen, but in doing so they have scarred the face of our last tumultuous wilderness with highspeed motor roads, and the peace that once was Indian Gap is now a raucous screech of auto horns. The healing wind, full of the elixir of moist balsam, that once blew from the crest of Mingus is now a stench of gasoline and overheated motors. Gatlinburg is a string-town of blazing shops that look like honky-tonks. On one side of the all too narrow road one can see a banner, "INDIAN CURIOS SOLD HERE," and on the other side, "AUTHENTIC INDIAN CURIOS SOLD HERE." One may buy "MOUNTAIN HANDCRAFTS" and a few steps away "REAL MOUNTAIN HANDCRAFTS," and farther down the road one can purchase "THE ONLY AUTHENTIC MOUNTAIN HANDCRAFTS DONE BY REAL MOUNTAINEERS." To one who remembers the Gatlinburg of yesteryears snuggling sleepily against the base of old Le Conte, it is all very confusing. And when I stumbled into Andy Huff (remembering Andy of the wilder years) wearing a coat on a hot afternoon, it was the end. The next day, I took the road to Tuckaleechee Cove. At Townsend I got my grub-stake. I then turned left on the trace across Rich Mountain, Cove Mountain, and Tater Ridge, and refused to stop until I had reached the seclusion of Cades Cove.

Cades Cove is a deep valley carved out of the very heart of the Smokies, guarded at one end by that great massif culminating in Gregory Bald and at the other by the towering peak of Thunderhead. But all was not well in the Cove, for the mountain folk must leave and many of their hearths are cold. (I could not help but think of the many years ago when troops were sent into these same mountains to exterminate the Cherokees and how now the same Government was trying desperately to save them.) Will we realize a hundred years hence that the mountain folk were as much a part of the Great Smokies as the forests? Will the museum they are going to build tell their whole story? Will the beds they slept in, the cloth they wove and the tools they used, standing in rows under glass cases for the curious to gawk at, give us a picture of their lives? I fear not, for the day John Oliver and his strong-backed sons go out over Rich Mountain, never to return, something that all the wishing in the world can not bring back will have gone permanently out of those mountains.

After the mountain folk are gone, who will there be to tell with sympathy and understanding the true story of the naming of that pile of rock called Charlies Bunion? Who will remember Great-grandfather Russell Gregory who climbed to the mountain top early in the 1830's and cleared what is now the Rye Patch and built himself a cabin and raised great crops of cabbages and potatoes and who also built a stone blockhouse on what is now Gregory Bald, and after scattering salt as a lure, shot deer from

FIGURE 5. The west end of Cades Cove, Great Smoky Mountains. This picture was taken from Cades Cove Mountain and shows the great dome of Gregory Bald (4,948 feet elevation) at a distance of nearly seven miles.

its loopholes on moonlit nights? It was this same Russell Gregory whose sons fought on both sides in the Civil War and who himself was shot by the Rebels at the close of the war near the site of the present Post Office in Cades Cove. Soon we shall forget how Nate Sparks bought vast areas of mountain land at ten cents an acre and hired Mart Russell to clear what we now know as Russell Field. Even the new topographic map has dropped the names of Hall's Cabin and Spence Field. And so we lose the last link with the story of how that same Nate Sparks hired a man by the name of Spence to take his family and go to the mountain tops

east of the Gregory holdings and clear the forests and tend the cattle and sheep that grazed in the openings. But the Halls from Carolina coveted the grazing land which the Spences held and started a feud and, being more numerous, drove the Spences back over Thunderhead with gunfire. A crumbling chimney is all that remains of Hall's Cabin and in the lush grass under the lee of Rocky Top, the violets are thick where Spence once raised his cabbages.

Bote Mountain and Defeat Ridge shouldering up against Thunderhead:—Here are two names to conjure with. They still laugh in the Cove how the surveyors, taking the local name, first spelled it "Boat." (It is correct on the latest map.) It seems that shortly after the Cove was settled and cattle were being grazed on the high pastures, it was decided to build a road to the top in the neighborhood of Thunderhead. Two ridges were available, and since it was to be a community affair, the men-folk came together and had a vote. The result was a tie. It was an open vote and with characteristic pride and independence, each man refused to change his mind. But one member of the settlement, a new arrival from northern Europe, came to the meeting late. To him was left the burden of breaking the tie. After due deliberation, he pointed to one and said: "Ay bote vor dis von." The other ridge was named "Defeat."

It was on the upper slopes of Bote Mountain along this old road that Dr. H. M. Jennison and I found a *Vaccinium* bearing the characters of all the *pallidum* group of species. Its stems were thick as a man's arm and the fruit was borne on slender branches twenty-five feet from the ground. It looked like the great-grand-daddy of all the blueberries on the mountain.

Among the interesting features of the Great Smokies are the "Balds." They are of two types. In the western part of the range (the Great Smokies, contrary to popular thought, are an east-west range, not a north-south one) the balds are mainly grasslands, while in the eastern part they are wild tangles of unforested areas known as "slicks" and covered mainly with various ericaceous (Heath Order) shrubs. There has been a great deal of argument and much has been written about the origin of both types. I have little more to contribute. The heath balds, however, seem to be a more natural unit of the ecological associations of the Great Smokies than do the grass balds. The history of many of the grass balds is known and to a large extent they are the result of

clearing followed by intensive grazing. John Oliver of Cades Cove related to me how, as a young man, he herded cattle up on the mountain tops between Thunderhead and Ekaneetlee Gap and remembered some of the fallen trees in the clearings. Giant oaks, they were, that were "waist high when down." According to Mr. Oliver, the method was to cut down the "small stuff" and "deaden the big stuff" by girdling. After a number of years (rotting is slow at high altitudes) these big trees would blow down and it was the remnant of these he remembered. It is even thought by some, and upon very good evidence, that others of the balds were made by Indians, not through the accident of fire, but wilfully, to produce grasslands which would lure the deer and thus make summer hunting easier. If so, it is probable that whole families migrated to the upper slopes and one can but envy them their choice of summer homes.

Among the grassy balds, Gregory Bald to me has always stood apart. In general, the grassland on the balds ends abruptly at the line of trees along the margin, but on Gregory, for the most part, a shrub-zone intervenes. It may well be that some clearing has been done at certain places around the margin, but when Russell Gregory built his stone blockhouse there in the 1830's it was already a bald. At that time (according to Mr. Oliver) there was "only a small grass patch" on the bald, and around this patch were a "lot of big sweet huckleberries" (*Vaccinium* sp.). This would corroborate my previous contention (Ohio Jour. Sci. 31:157-164, 1931) that, at the advent of the white man, Gregory Bald was mainly an ericaceous bald, but different from those in the eastern part of the range. Several species of low willows are present and other shrubs such as the hawthorn (*Crataegus roanensis*) may be found near the forest margin. But the fact remains that today Gregory Bald bears on its great wind-swept dome the most striking and choice assortment of ericaceous genera and species of any of the grassy balds. Here I found the "big sweet huckleberry" (a *Vaccinium* of the *pallidum* group of species) and with it Buckley's rare hairy "huckleberry" (*Vaccinium hirsutum*) whose nearest relative grows in the high mountains of Central America. It is a true blueberry, but its hairy black fruit is insipid, like so many of its Central and South American cousins, with nothing of the tart sweetness of the others in whose shade it grew. It was on Gregory Bald that I found the most bizarre and

taxonomically most vexing, natural collection of azaleas I have ever seen.

It seems that no less than three species of azalea started out in this area. One was a low-growing early-blooming white-flowered species. Another, blooming slightly later, bore large yellow flowers, and the last to open its buds was a tall, deep-red flowered thing, very much like the now famous red azalea of Big Black Mountain in Kentucky. One of the plants had small smooth leaves with a pale glaucous lower surface and another had large rough leaves with green under-surfaces. Each year these plants bloomed. And each year the last flowers of the earlier species opened at the same time as the earliest flowers of the next later species. And the biologically inevitable happened. And the seeds thus formed were fertile and fell to the ground and grew, and in due course of time produced plants that bore flowers. And these plants looked like neither of their parents. And from these plants went out pollen. And to these same plants came pollen from other plants which were not like themselves. And *their* seed was fertile. And this was already an old custom among the azaleas on that mountain top long before Russell Gregory built his stone block-house and spread salt in the grass-patch and shot deer on moon-lit nights. Today no two plants look alike, yet all have something of each other.

To duplicate the colors of the azaleas on Gregory Bald one would need to make every possible combination between crimson, yellow, and white. In the grab-bag of hybridization, leaves have been shuffled from plant to plant, the correlations between flower form and color have not been sacred, and new combinations have arisen, the likes of which those who have written learned treatises on azaleas have never seen. Some of these new genetic combina tions might prove to be stable and under the proper conditions have offspring like themselves. Thus a new species would be born. This is part of the raw meat and mechanics of evolution and we may have a chance here to watch it while it happens under natural conditions. But it has been promised that the motor road will be built from Clingmans Dome to Deals Gap—and this road, because of the spectacular view, will pass over the top of Gregory Bald. They will bring steam shovels and scrapers and horses and mules and men. And these plants will be torn out by the roots and those that are not dug up will be covered by the dumpings of the scrapers. Should any survive these, they will be trampled by the mules and

men. And thus will pass the azaleas on Gregory Bald. Yet it probably is a good thing, for they are a troublous and vexatious lot to the taxonomist and it would be a good thing for the peace of mind of future botanists if they were destroyed root and shoot. It does seem a pity, though, for they are pretty.

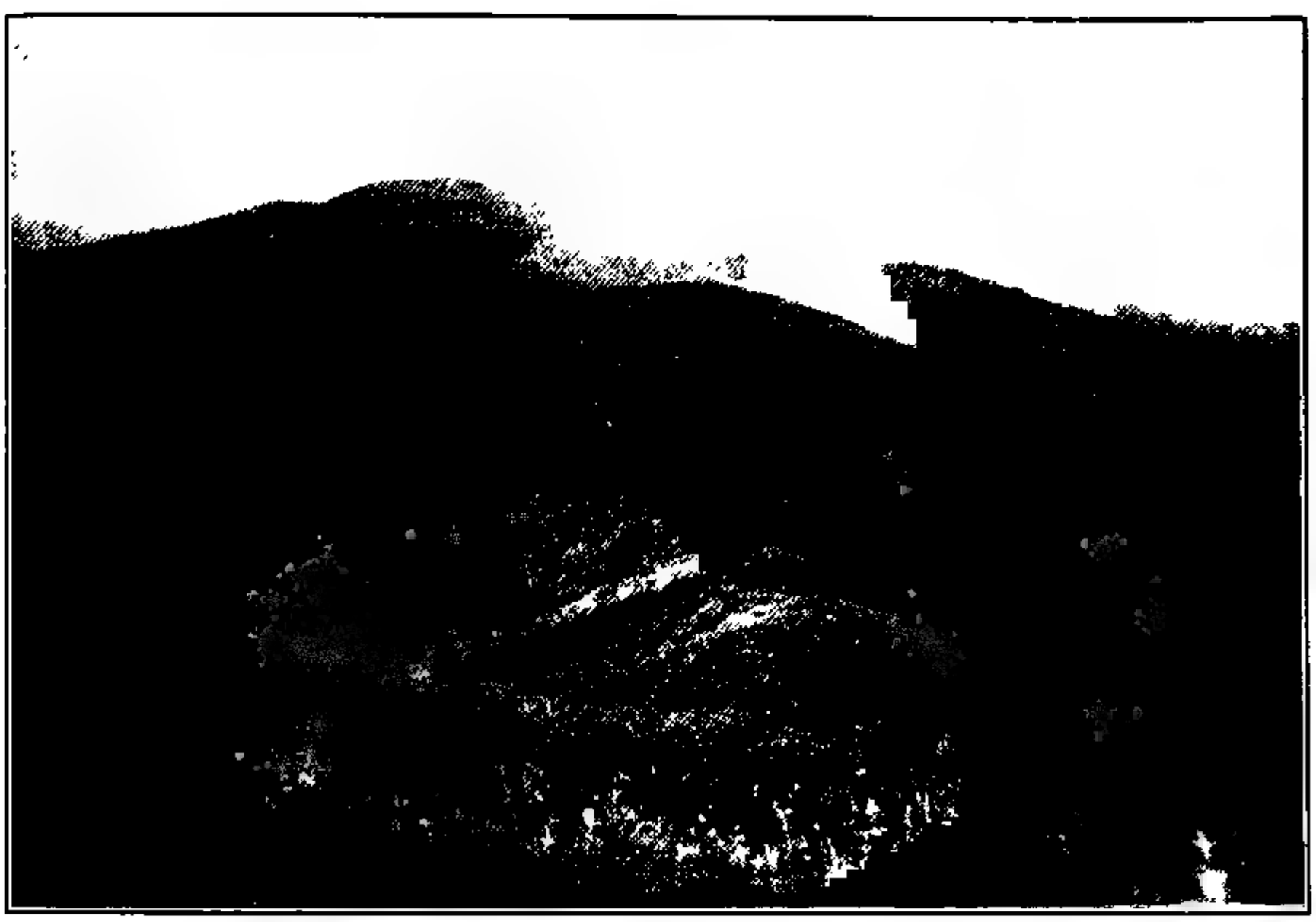

FIGURE 6. Clingmans Dome (6,642 feet), the highest point in Great Smoky Mountains National Park, and the second highest in eastern United States. This photograph was taken from Silers Bald (5,622 feet elevation) at a distance of over three miles. The meandering ridge leading to the Dome is the state line between Tennessee and North Carolina. The treeless area on the ridge is a small grass bald.

But the Park must be "developed and improved" and another great highway is to be built to lure the tourists so that the Annual Report will show that more people have passed through the Park and so that the vermin scuttling around its margin can sell more trinkets made, not in the mountains, but in a ghetto sweat-shop in some far-away city. The building of fire-control roads and hiker's trails is a necessity. And, too, I have all honor for those who in good faith are helping the mountain folk revive their ancient arts and crafts. Theirs is a real service. But all too often, the developments and improvements consist of spectacularly engineered roads and boulevard parking lots on the only level places available for certain plants to grow.

If the projected road is carried through as planned, it will create, with its adjacent "developments," a greater havoc than the one from New Found Gap to Clingmans Dome. The ridge west from the Dome winds tortuously across Mt. Buckley to Silers Bald and on to Thunderhead, Gregory Bald, and Deals Gap. In some places the crest is narrow and rocky, scarce wide enough for a foot trail, and here the rocks with their assemblage of rare endemic plants will be blown away. Where the crest is wider, men will come with

FIGURE 7. A forest of dwarf beech trees at the margin of a small bald on the crest of the ridge between Rocky Top and Thunderhead, in Great Smoky Mountains National Park. The characteristic smoke-like mountain cloud—from which the Smokies get their name—may be seen sweeping in from the Tennessee side of the range.

axes and cut down the ancient forests of dwarf beech, for they are found only on the tops of these high ridges. And worst of all, where the peaks are too steep to send the road across, it will be swung around them through the gaps. Here in these passes where the water seeps down from the peaks and the soil is dank and wet the purple-fringed orchis (*Blephariglottis psycodes*) nods in the meadow sedge and here the Turk's-cap (*Lilium superbum*) shakes its orange bells among the clouds. Linnaeus knew not how well he named this plant, for here on the crest of the Great Smokies it grows to ten feet tall, many plants bearing twenty-five flowers and some with nearly fifty. But men will come with shovels, and the marshy spots will all be drained and filled with

rubble blasted from the rocks where saxifrage and wild blue gentians grow. And the purple orchis and the Turk's-cap and the saxifrage and the wild blue gentians will be no more. So too will pass perhaps the last plant in the region of the rarest of all our raspberries, *Rubus carolinianus.*

I am glad that I have tramped along this ridge and climbed its peaks before they build a road and make the Appalachian Trail a mockery;—while winds were clean and peace lay deep on every mountain-top; while azaleas bloomed each summer time on Gregory . . . and I remember that one plant, one among the thousands, standing proudly erect with great, creamy white flowers, no blemish or spot of any color on the corolla, not even on the petal where a spot should be. The anthers were golden and the filaments and style were tinted a delicate pink. Standing on Gregory Bald with the rain beating in my face I knew of its presence before I saw it, for the wet wind brought me a fragrance as from no azalea I had ever known. Altogether, there is no other azalea in the whole world quite like it. And it too will be gone, what with the steam shovels and the scrapers and the mules and the men.

W. H. Camp.

VICTORIA CRUZIANA

A plant of *Victoria Cruziana* growing in the recently remodeled tropical aquatic house in Conservatory Range I has attracted considerable attention from the visiting public since the latter part of the summer. Although smaller in leaf than the more widely publicized *Victoria regia,* it is nevertheless a striking plant, and well worthy of a place wherever facilities permit of its cultivation. Obtained through the courtesy of Mr. Stanley G. Ranger, our plant was set in its present position in mid-May. It grew rapidly, and by early August the first flower opened. From then on a new bloom developed every three or four days. At the beginning of October our specimen possessed a dozen well-developed leaves and spread over a circle twenty-two feet in diameter. Mature individual leaves measure fully forty inches across and are turned up at the margin to form a rim four or five inches deep. The flowers expand in the night and at first are carried well above the water, but during the second night they drop to the water level and change from pure white to deep pink. They remain attractive for two days.

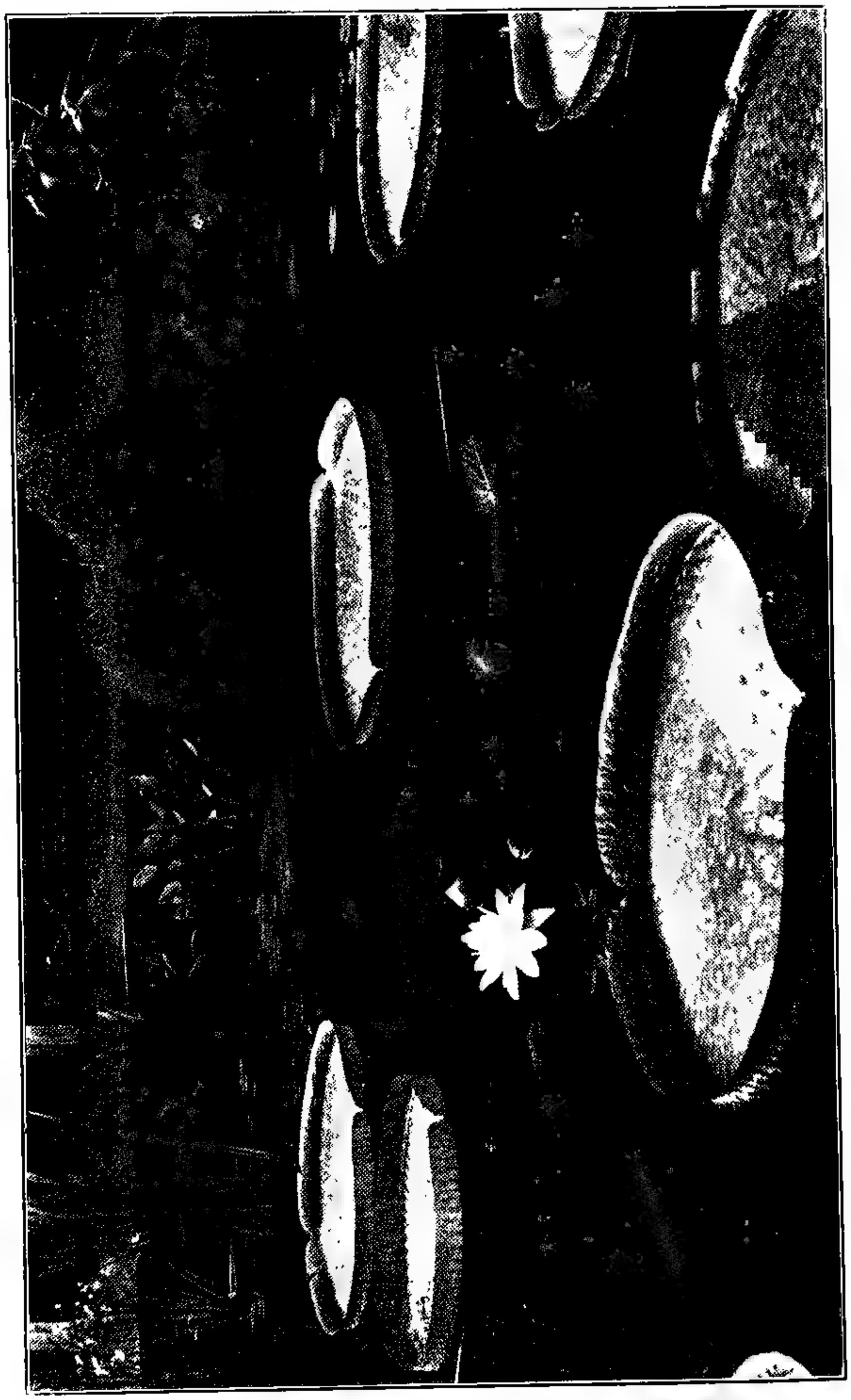

Abb. 41 - Ansicht eines Hauses in Conservatory Range Nr. 1.

Victoria Cruziana, which is a native of the Paraná River and its tributaries in southern Brazil and Paraguay, from where it was introduced by William Tricker in 1894, is hardier than *Victoria regia,* of the Amazon, and consequently much better adapted for growing in outdoor pools. Even so it must be nursed indoors for the first six or eight weeks, and in the vicinity of New York the best specimens are obtained only under greenhouse conditions.

Like all waterlilies the Victorias are gross feeders and they require rich soil and ample root-room. Our specimen is planted in a concrete and brick receptacle nine feet square and four feet deep. Into the bottom of this a foot or more of broken brick was placed to ensure free water circulation before filling up with prepared soil. The crown of the plant is about nine inches below the surface of the water. Full exposure to sunshine and a water temperature of from 75 to 90 degrees are essential for good growth. Every ten days or two weeks lime is added to the water to maintain it in a sweet condition. Although the plant is perennial, the best results are obtained with Victorias when new plants are raised from seed each year, the seed being sown in late January or February.

T. H. Everett.

ASIATIC IMMIGRANTS IN THE BOTANICAL GARDEN —VI.

Fruits of the two related genera considered below—*Morus* and *Prunus* have furnished food for man and other animals from remote prehistoric times, and they have representatives extending well around the globe in the present geologic period. Mulberries and plums have been extensively used both in the native state and in countless forms developed to greater abundance and usefulness by man. These plants are not slow in establishing themselves naturally where they have once been planted.

The white mulberry (*Morus alba*) was planted in the arboretum of the Botanical Garden in 1910, the specimens having come from the Biltmore Nurseries. However, it had most likely been already growing naturally on the farm lands that ultimately comprised the Garden area, for the white mulberry was frequently planted near farm houses in the earlier days. Later it spread to fields, particularly fence-rows, through the agency of birds. The red mulberry,

a native tree which grew naturally in woods, also used to be planted on farms. But whether planted or not, it soon came into evidence about farm houses because of animals who would carry the seeds from a nearby tree or from the woods and drop them in a place where they would sprout. The mulberries thus became members of the fence-row plant-population along with the persimmon and other fleshy-fruited trees within their natural range.

It is to be expected that trees cultivated from prehistoric time in all kinds of habitats and soils would develop fruits of different values. Although the fruits of all mulberries are edible, those of some trees greatly excel others in size and flavor. The mulberry-tree's greater values have been in the leaves, which furnish pabulum for silk-worms, and the inner bark, which has been a staple in clothing for aboriginal tribes in both hemispheres and in the manufacture of household articles of use to more primitive peoples.

The Maximowicz cherry (*Prunus Maximowiczii*) was introduced into The New York Botanical Garden from the Royal Botanic Gardens, Kew, England, in 1901. This tree was not named and described until 1857. The original specimens came from Manchuria. Korea, Japan, and Sachalin were later added to the range. The plant was not brought into cultivation in the New World until thirty-five years after it had been named. Botanically it is a relative of the mahaleb or perfumed cherry, *Prunus Mahaleb,* a native of Europe which has been naturalized in America for well over a century. The tree produces numerous white flowers of medium size in conspicuously bracted inflorescences and clusters of fruits that are red at first but turn black at full maturity. The economic value of this cherry lies in its use in horticulture as a stock upon which varieties are grafted.

JOHN K. SMALL.

A GLANCE AT CURRENT LITERATURE*

The parks of New York State—from Long Island to Niagara and from the Thousand Islands to the Allegheny region—are described in a booklet issued this year by the State Council of Parks. The natural features and the provisions for picnicking, camping,

* All publications mentioned here—and many others may be found in the Library of the Botanical Garden, in the Museum Building.

and sports in each of seventy public parks are mentioned. Maps and photographs illustrate the booklet, copies of which are obtainable from the State Office Building either in Albany or at 80 Centre Street, New York City.

* * *

"Hemlock—The State Tree of Pennsylvania" is the subject of a booklet by Henry E. Clepper, published by the Department of Forests and Waters of Pennsylvania. Hemlocks of North America and of Asia are described, with emphasis placed on the characteristics, uses, and picturesqueness of *Tsuga canadensis*.

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As a reprint from *Health News*, the Division of Public Health Education of New York State is distributing a pamphlet on ivy poisoning.

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A check-list of 2,000 species, varieties, and hybrids of *Fuchsia* has been compiled by O. E. Essig for the American Fuchsia Society. It contains 204 references to literature on the genus.

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How carbon dioxide treatment for fruits being shipped retards softening and decay in transit is explained in Technical Bulletin 519 of the United States Department of Agriculture.

* * *

In the summer bulletin of the Horticultural Society of New York there appears a practical article on "Sweet Pea Culture for the Average Man" by James S. Kelley.

* * *

The new *schizocoronati* (cleft-corolla) daffodils which are being developed in Holland are described in the July number of *The New Flora and Silva*. So far, the breeding has been confined to yellow and bicolor trumpets and to varieties of *Narcissus incomparabilis*, but it is expected soon to take in *Leedsii* and *Barrii* hybrids.

In the same issue, Dr. J. Horace McFarland contributes an article headed "Roses in Landscape Planting."

* * *

In honor of William Albert Setchell, professor of botany at the University of California since 1895, a book of "Essays in Geobotany" has been compiled, written by a group of his professional associates from many parts of the world, edited by T. H. Good-

speed, and published by the University of California Press. The subjects include a wide variety of topics, written by O. W. Arrhenius, E. B. Babcock, F. E. Clements, W. S. Cooper, Ludwig Diels, F. E. Fritsch, D. R. Hoagland, E. D. Merrill, Eduard Rübel, and Carl Skottsberg.

* * *

"The Species Problem in Iris" is the subject of a series of five papers appearing in the September *Annals of the Missouri Botanical Garden* and constituting what Edgar Anderson, the author, calls "a final comprehensive report." Dr. Anderson published previous papers on the subject in 1928 and 1933. *Iris virginica* and *Iris versicolor* have been the special subjects of this study, with the related *I. setosa* also considered. After a brief introduction the author treats the taxonomy of the northern blue flags; the phylogenetic relationship of the two species being studied, the intra-specific differentiation in the northern blue flags, and the evolutionary patterns of the genus *Iris*.

Because the fruits of *Iris* species provide such a useful set of characters for determination, Dr. Anderson requests seeds and seed capsules of *Iris virginica*, "no matter how unattractive the partly decayed state of the latter," to be incorporated in the herbarium of the Missouri Botanical Garden.

* * *

Photographs and notes by B. Y. Morrison on two dozen species tulips are among the interesting subjects in the July number of the *National Horticultural Magazine*.

* * *

"Common Mushrooms" is the title of *Botany Leaflet 18* of the Field Museum of Natural History, prepared by Leon L. Pray. Photographs and sketches showing the habit of growth illustrate the 68 pages.

* * *

Part VI of the *Flora of Peru* by J. Francis McBride appears as Volume XIII of the Botanical Series published by the Field Museum.

* * *

L. H. Bailey continues his studies of the palms with the publication of the Arecastrums (the queen palms) and the Butias in Fascicle I of Volume IV of *Gentes Herbarum* —occasional papers on the kinds of plants.

Cultural directions for tuberous-rooted begonias, clematis, and tigridias are given in the October 1 issue of *Breeze Hill News*. An appraisal is made of many varieties of petunias.

* * *

Woody plants with ornamental fruits are listed by Donald Wyman in the Arnold Arboretum's *Bulletin of Popular Information* for October 1.

CAROL H. WOODWARD.

NOTES, NEWS, AND COMMENT

Returning October 14 from The New York Botanical Garden's Rocky Mountain Expedition, E. J. Alexander reports that seeds of approximately 100 species of alpine plants were collected for distribution among the subscribers of the trip. Incidental collections included seeds of a large number of plants which will be used for exchange purposes with botanic gardens and with other institutions.

Stephen G. Cutting, student gardener, who accompanied Mr. Alexander and T. H. Everett at the beginning of the trip, returned to his duties at the Botanical Garden the middle of August. He was replaced in the West by one of the other student gardeners, Martin J. Crehan, who returned last month with Mr. Alexander.

Collecting was done in western Montana, Wyoming, Colorado, and in sections of the surrounding states, chiefly on the slopes of Pike's Peak, Medicine Bow, Long's Peak, Grand Teton, and in many important mountain passes. Between July 10, when the expedition left New York, and the return in October, 14,800 miles were covered.

* * *

The Science Course for Professional Gardeners, given by The New York Botanical Garden primarily for its student gardeners and open to other professional gardeners approved by the National Association of Gardeners, began its fifth year of classes on October 5. The courses are being conducted as formerly in the rooms of the Horticultural Society of New York.

* * *

Mr. Robert P. St. John, who is making a special study of North American ferns and fern-allies, is spending two weeks at the Garden studying the ferns of several genera as represented in the

eastern United States and Canada. Especial attention is being paid to the critical species of *Dryopteris* growing in the Atlantic and Gulf Coastal Plains. While at the Garden last spring Mr. St. John finished a monograph of the genus *Thelypteris* in North America. The results are embodied in the manuscript of Dr. Small's "Ferns of the Southeastern Flora," which is about ready for the printer.

* * *

At the invitation of Dr. M. A. Chrysler, Dr. B. O. Dodge addressed the biological seminar at Rutgers University October 1 on "Some genetic phases of the pink bread-mold, *Neurospora.*" The seminar was composed of bacteriologists, physiologists, mycologists, and pathologists of the University and of the New Jersey Agricultural Experiment Station.

* * *

The last work on the steam trench which has been in the process of construction during the past two years at the Botanical Garden was completed the middle of October. As an additional aid in keeping the Museum Building comfortable on windy winter days, brass weather-stripping has been inserted in all the window frames.

* * *

Dr. and Mrs. Harold N. Moldenke returned to New York October 13 after a year spent abroad, where he studied at Kew and other institutions on a National Research Council fellowship. He resumed his work at the Garden November 1, while Mrs. Moldenke is continuing her studies here on the Patellariaceae.

* * *

E. B. Bartram of Bushkill, Pa., spent some time last month at the Botanical Garden, studying in the Elizabeth Gertrude Britton Moss Herbarium.

* * *

Dr. A. C. Smith was in Washington, D. C., for a week in October, working on Amazonian legumes.

* * *

George Lupton, who has been employed at the Botanical Garden for a little more than two years, and who has completed his training as a student gardener, has left to take a position as assistant gardener on the estate of S. Z. Mitchell at Glen Cove, Long Island, New York.

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Some of the leading features of The New York Botanical Garden are:

Four hundred acres of beautifully diversified land in the northern part of the City of New York, through which flows the Bronx River. A native hemlock forest is one of the features of the tract.

Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

Gardens, including a new rock garden, a large rose garden, a perennial border, small model gardens, and other types of plantings.

Greenhouses, containing thousands of interesting plants from America and foreign countries.

Flower shows throughout the year—in the spring, summer, and autumn displays of daffodils, lilacs, irises, peonies, roses, water-lilies, dahlias, and chrysanthemums; in the winter, displays of greenhouse-blooming plants.

A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants; also historic microscopes.

An herbarium, comprising more than 1,800,000 specimens of American and foreign species.

Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

Scientific research in laboratories and in the field into the diversified problems of plant life.

A library of botanical and horticultural literature, comprising nearly 45,000 books and numerous pamphlets.

Public lectures on a great variety of botanical and horticultural topics, continuing throughout the autumn, winter and spring.

Publications on botanical subjects, partly of technical, scientific, and partly of popular, interest.

The education of school children and the public through the above features and the giving of free information on botanical, horticultural and forestral subjects.

The Garden is dependent upon an annual appropriation by the City of New York, private benefactions, and membership fees. Applications for membership are always welcome. The classes of membership are:

Annual Member	annual fee	$ 10
Sustaining Member	annual fee	25
Garden Club Membership	annual fee for a club	25
Fellowship Member	annual fee	100
Member for Life	single contribution	250
Fellow for Life	single contribution	1,000
Patron	single contribution	5,000
Benefactor	single contribution	25,000

Contributions to the Garden may be deducted from taxable incomes. Bequests may be made in the form of securities, money, or additions to the collections. The following is an approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 ***of*** 1891, ***the sum of*** ———.

Conditional bequests may be made with income payable to donor or any designated beneficiary during his or her lifetime.

Fellowships or scholarships either in perpetuity or limited to a definite period may be established for practical student-training in horticulture or for botanical research.

All requests for further information should be sent to

THE NEW YORK BOTANICAL GARDEN
BRONX PARK, NEW YORK, N. Y. (FORDHAM BRANCH POST OFFICE)

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JOURNAL
OF
THE NEW YORK BOTANICAL GARDEN

CASCADE CHRYSANTHEMUMS
T. H. EVERETT

EXOTIC SHRUBS AND TREES NATURALIZED IN THE VICINITY OF NEW YORK
JOHN K. SMALL

INDOOR DISPLAYS OF FLOWERING PLANTS

WINTER LECTURES AT THE GARDEN

REGIONAL TYPES OF CORN SHOWN IN EXHIBIT

A GLANCE AT CURRENT LITERATURE
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NOTES, NEWS, AND COMMENT

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ADVENTURES WITH HARDY BULBS
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THE WILD GARDEN
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P. J. MCKENNA

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JOURNAL
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CASCADE CHRYSANTHEMUMS

A cascade chrysanthemum is a plant which instead of growing erect has its main stems depending over the side of the pot or tub in which it is grown, often for a length of several feet, so that when it is in bloom it forms a veritable floral cascade. Plants of this kind have become increasingly popular during the last five or six years, as they lend themselves well to use in novel decorative effects.

Contrary to a rather common belief held by amateur gardeners, cascade chrysanthemums do not represent a distinct type, but owe their form rather to a manner of training. True, only those varieties having pliable stems are adapted for growing this way, but they all will form erect bushy plants unless persuaded to do otherwise by the artifices of the skilled gardener.

The cascade method of training chrysanthemums was developed in the Orient and was first made known to western growers by Kan Yashiroda of Kagawaken, Japan, who as a student was a contemporary of mine at Kew. In 1929 Yashiroda forwarded to me in America a few seeds of the Japanese mountain varieties of chrysanthemums together with notes on the new method of training. Cascade plants raised from these seeds were first brought into bloom at the estate of Mr. H. E. Manville, Pleasantville, N. Y. In January, 1930, an article contributed to the *Gardeners' Chronicle* (3rd series, **87**: 28) by Yashiroda on "Cascade Chrysanthemums" excited considerable interest both here and in Europe, and a number of growers experimented with domestic varieties with varying degrees of success. The first public showing in America of plants raised in this way seems to have been made in the fall of 1930 by the Missouri Botanical Garden. An account of these plants appears in the Missouri Botanical Garden

Bulletin (**18**: 159). In England plants were exhibited in November of the same year by Mr. H. Woolman before the National Chrysanthemum Society and at a meeting of the Royal Horticultural Society. The first cascade chrysanthemums placed on public display in New York came from the Manville estate. They were shown at the November, 1931, meeting of the Horticultural Society of New York and were described in the Year Book for 1931, pages 18 and 21. As a result of this exhibit many requests were received for information as to their culture and in response an article appeared over my signature in the *Gardeners' Chronicle of America* in May, 1932 (**36**: 161). In the same year classes for cascade chrysanthemums were included for the first time in the schedule of the Fall Chrysanthemum Show of the Horticultural Society of New York and these classes brought forth several worthy exhibits. Last month cascade chrysanthemums made their debut in New York florists' windows.

In the *Gardeners' Chronicle of America* were given the cultural directions quoted below. Further experience has not indicated any need for revision.

"The cultural requirements of cascade chrysanthemums are exactly similar to those of other greenhouse 'mums', except in the matter of training, and this necessitates considerable attention and much patience. The cuttings are made and inserted in the sand bench any time from January to April, according to the size the finished plants are required to be. Growers should remember that while big plants with seven-foot growths and thousands of flowers are truly magnificent in appearance, smaller examples in seven- or eight-inch pots and four or five feet in length are usually more useful for decorative purposes.

"When the young plant is a few inches high, the growing tip is pinched out in order to induce branching. Of the shoots which appear as a result of this operation, the strongest is selected as a leader and the others are again pinched back when they develop three leaves. A stake is then inserted in the pot at an angle of 45 degrees and the leader is kept tied down to it, and from this time onward throughout the summer it is of the utmost importance that this stick, and consequently the growing point of the leader, point toward the north. This arrangement permits the lateral growths which appear, to receive the maximum amount of light, as reference to the diagram will show. All growths, with the exception of the growing point, must be stopped at the second or third leaf-joint, and this operation must be repeated as often as necessary until the middle of August, after which date pinching ceases.

FIGURE 1. Cascade chrysanthemums displayed in Range 1 at The New York Botanical Garden during November.

"Throughout the summer, potting into successively larger pots is attended to as growth demands, the soil being sweet and rich as is appreciated by all 'mums'. In Japan the ingredients of the potting compost are proportioned with fine exactitude and mixed with the greatest care. The most successful growers haye their own special formulae, which they guard as professional secrets. This meticulous regard for detail hardly seems justified, however, for the mountain chrysanthemums respond admirably to the treatment usually accorded chrysanthemums by American growers. It is important that the potting soil be rammed quite firmly about the roots to encourage a sturdy short-jointed habit.

"Watering must, of course, receive special attention, and at least once every week or ten days the plants should be thoroughly

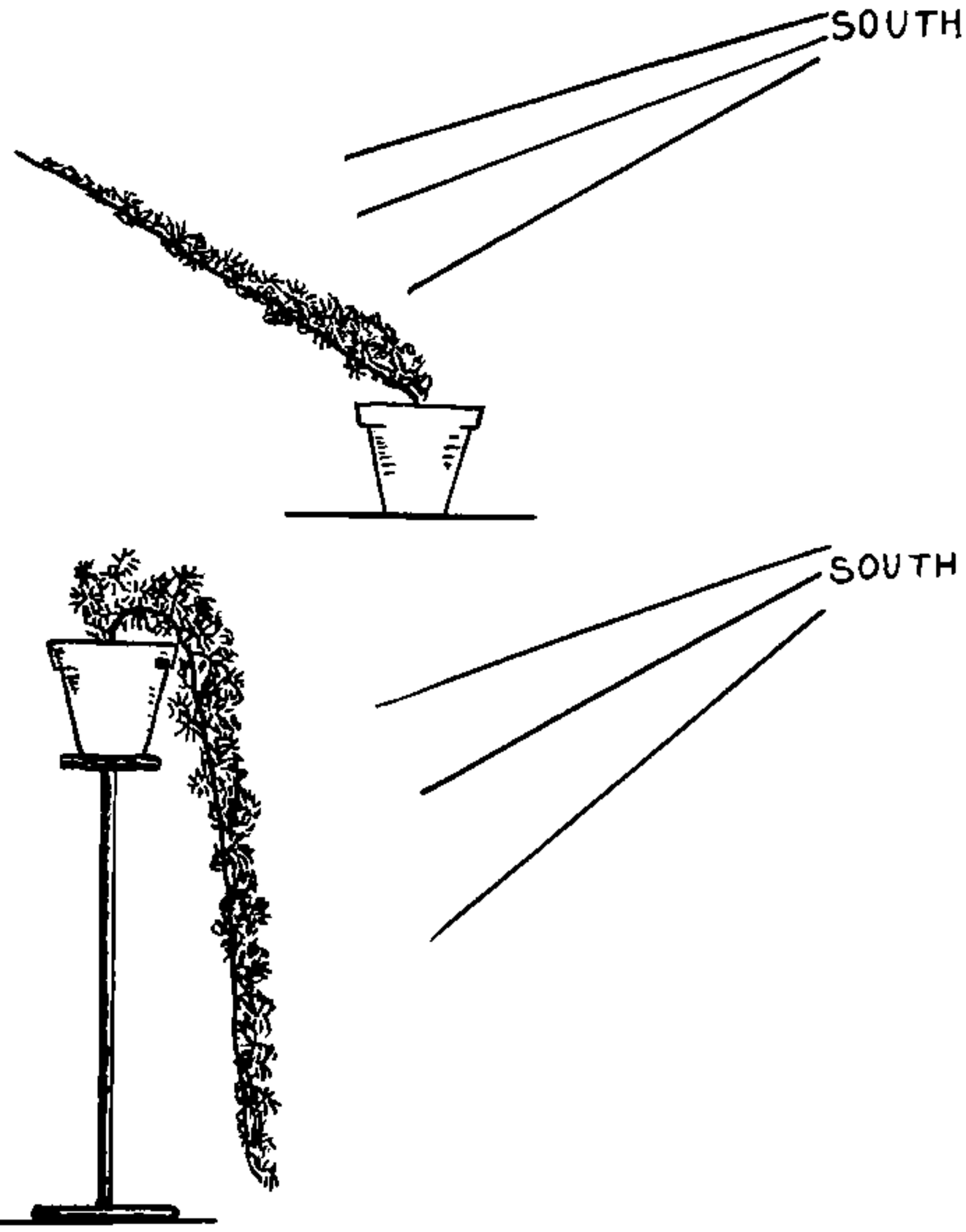


FIGURE 2. Diagram showing position of cascade chrysanthemum plants in relation to light: above, during the growing season; below, after the buds have formed.

sprayed with an approved insecticide. This treatment is based upon the axiom that an ounce of prevention is worth a pound of cure. On all bright sunny days throughout the summer, spraying the foliage with clear water from the hose will prove beneficial as a control measure for pests, and as a means of supplying the atmospheric humidity necessary to prevent the growths from hardening. A position in full sunshine in a thoroughly well-ventilated greenhouse is best from a cultural viewpoint.

"About the time of the last stopping, the work of bringing the plant to a horizontal position should be begun. This is done by gradually lowering the stake a few inches at a time at three- or four-day intervals until the desired position is attained, and in such position the plant is allowed to remain until the flower buds are well set, when the operation of 'hanging' must receive attention.

"Hanging is a delicate task and requires care, for the stem can be readily snapped and the work of a season undone by any but gentle handling. First, the supporting stick is removed, the long stems resting on the arms of a helper meanwhile. The pot is then raised upon a suitable stand and the stems are lowered until they hang vertically over the side.

"After hanging, the pots must be so placed that the flowers are faced to the south, a position which enables them to receive at this stage the full benefit of the available sunlight. This detail is of the utmost importance to the uniform development of the flowers.

"Should the main stem appear to be too brittle to permit of hanging without danger of breaking, take some fine copper wire and wind this in a tight spiral about the portion of the stem where the bending will take place, and then bring the stem as gradually as possible into the new position, the wire to be carefully removed a few days later."

Among the best chrysanthemums for training in cascade fashion are seedlings of the species *C. morifolium*, *C. indicum*, and *C. japonicum*. A number of our garden varieties also have been used successfully. Particularly adapted for this purpose is the American-raised variety, Jean Hart.

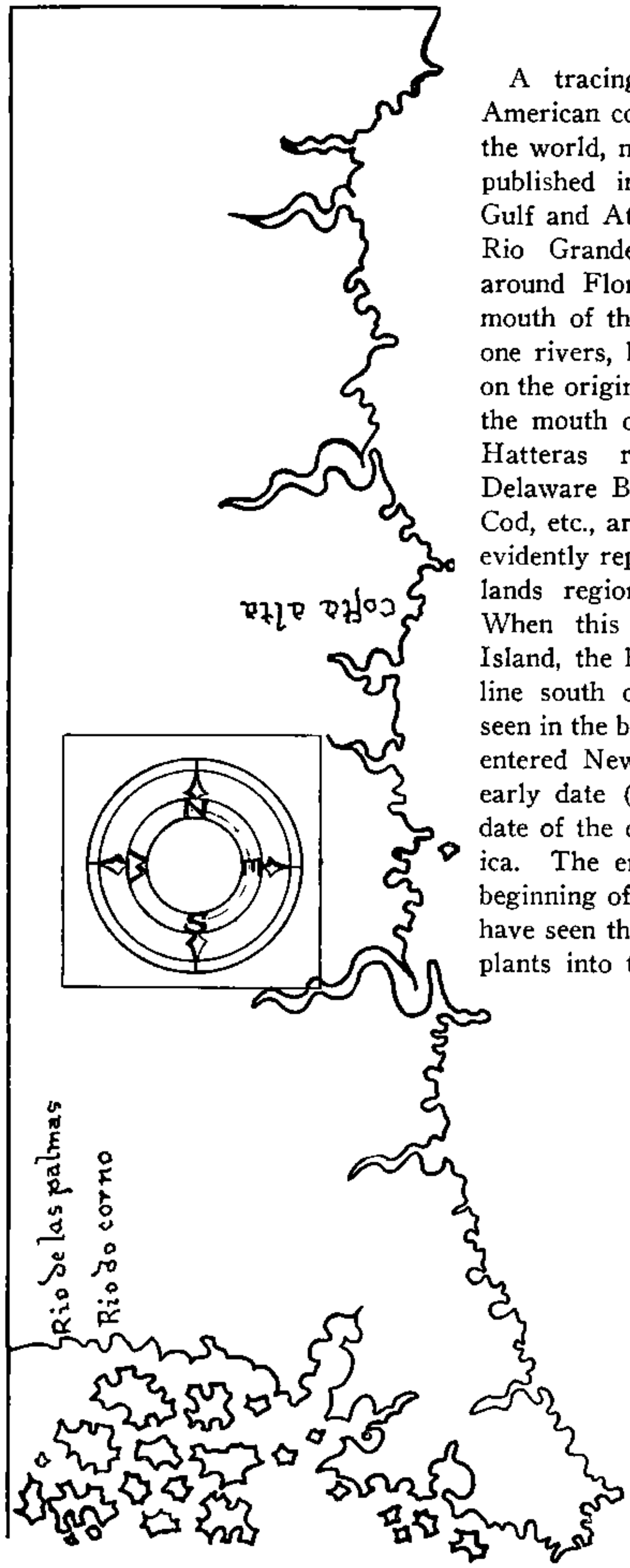
Recently several growers of exhibition plants have trained their cascade chrysanthemums to broad strips of chicken-wire instead of to stakes as is done by the Japanese. This practice results in monstrous specimens resembling dense casket covers and completely lacking the grace and charm possessed by plants having a more informal growth.

T. H. Everett.

EXOTIC SHRUBS AND TREES NATURALIZED IN THE VICINITY OF NEW YORK

Many interesting problems present themselves in connection with the introduction of exotic plants into a new country. One of these is how early the introductions began. The seeds of some plants are so easily distributed and prompt to grow that they may be introduced to a new country with the first arrival of ships. On the basis of the accompanying map, European plants may have been introduced on our shores within a decade after the discovery of the New World by Columbus.

This map of the eastern coast of North America is part of a map of the world compiled by Cantino of Modena, Italy, in 1502,



A tracing of the eastern North American coast of the Cantino map of the world, made in Modena, Italy, and published in 1502. This covers the Gulf and Atlantic coast lines from the Rio Grande (Rio de las Palmas) around Florida and up to about the mouth of the St. Lawrence. Twenty-one rivers, bays, and capes are named on the original. On the Atlantic Coast the mouth of the St. Johns, the Cape Hatteras region, Chesapeake Bay, Delaware Bay, New York Bay, Cape Cod, etc., are represented. Costa Alta evidently represents the Atlantic Highlands region south of Sandy Hook. When this point was cited Staten Island, the highest point on the coastline south of Maine, may have been seen in the background. Boats evidently entered New York harbor before that early date (1502), perhaps before the date of the official discovery of America. The end of the fifteenth or the beginning of the sixteenth century may have seen the introduction of European plants into the Local Flora Area.

from records of the discoveries of earlier navigators. The mainland part of the map is especially interesting to us. Among other points, it clearly indicates the mouth of the Rio Grande (Rio de las Palmas), the Mississippi River (Rio do Corno—referring to the hook of the Delta), and the Florida Peninsula (Cabo do fin do Abrill). But what is most interesting is the "Costa Alta" which evidently is intended to indicate the present Atlantic Highlands, New Jersey[1]. Above this point Sandy Hook and New York Harbor are clearly indicated. Manhattan Island itself may thus have been visited by Europeans at this early date.

It may be then that exotics, at least herbs, were introduced in our Local Flora Area as early as 1500 or even before that date.

Manhattan Island was definitely discovered by Europeans in 1524, but it was not until nearly a century later that a permanent settlement was made at the southern end of the island, which with the surrounding country at this time had its population of native shrubs and trees. The transient visitors and later the immigrants from Europe naturally introduced and established their Old World civilization as far as possible on the island, part of this civilization being the vegetation they cultivated, without which they would not feel at home, for they liked their Old World plants.

Our woody exotic flora is dominantly Linnaean in generic and specific aspect. Forty-six of the shrubs and trees, given us for the most part by Europe and a few by Asia, were designated by Linnaeus. Sixteen species were described by authors other than Linnaeus. Ten of the Linnaean species were ultimately removed from the generic designations he had made in 1753. About twenty percent of the Linnaean species were transferred to genera more natural than those in which Linnaeus had placed them. The Linnaean contemporaries and their successors began to clarify matters of classification, a welcome move except to those who abhor the use of more than a few names or cannot realize the joy of learning new ones. It has been suggested that those who prefer mere simplicity in classification instead of scientific accuracy should go back to the nomenclature of Linnaeus and revert to his arithmetical classification and undigested generic concepts, instead of the more or less natural system now in use. This reference to

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[1] Todt Hill, Staten Island, lying back of the Highlands, is the highest point on the Atlantic and Gulf Coast south of Maine.

classification suggests a very fundamental point. The post-Linnaean botanists gave us the beginning of a more natural classification to replace the arithmetical one. Now that the exploration of the geographical world for "new species" is fairly complete and will naturally draw to a close at no distant date, it seems to be high time for a beginning of exploration into the mysteries of the plants themselves, their "orders" and "families" as well as "genera". The relationships of "families" of the post-Linnaean masters as we use them are still artificial. The "genera" have been little explored and we still use in the interpretation of our plants both for the profession and the laity the medley of simple or natural and complex or unnatural genera. The latter may be termed historical or traditional genera, but may have little to do with relationships. It is little wonder that the younger generation of botanists with unbiased training realize that there is something fundamentally wrong with our present orthodox interpretation of plants.

The early Europeans doubtless brought seeds of their herbs and woody plants, useful and ornamental, without delay. Thus was the beginning of the exotic flora of New York and its vicinity. Shrubs and trees useful as food-producers were doubtless the first woody plants to become naturalized members of our flora. We are surely safe in assuming that among them were the pear, apple, plum, peach, cherry, gooseberry, and currant.

Woody plants suitable for timbers and construction were naturally plentiful hereabouts. Huts for temporary habitation and a ship to replace one wrecked and destroyed were built of native materials as early as 1614. Here started the clearing of the native vegetation of Manhattan Island. Later the willow for making baskets and the buckthorn for medicine may have been introduced, and these, since they readily take hold of new habitats, soon established themselves. The native willows evidently were not satisfactory for basketry, or the Old World ones would not have been brought in. On the other hand, the native birches must have been satisfactory for brooms, for we do not have exotic birches.

Then came the ornamentals, such as appealed to the imagination of the several immigrant races. As the population grew the rate of introductions increased. Today, after a lapse of three centuries, out of the multitude of exotic shrubs and trees brought

to our shores from Europe, Asia, and Africa, about sixty-seven species have become naturalized in the vicinity of New York and in hardiness and vigor rank with our native species.

A glance at the list of our conifers fails to show a single truly naturalized species, but two, the juniper (*Juniperus communis*) and the low juniper (*J. sibirica*) are natives in both the Old World and the New. Fortunately, from the viewpoint of the early settlers, the juniper berries for flavoring their gin were at hand.

The staple food plants of Old World origin, which have already been mentioned, comprise about a dozen kinds. Besides these, about fifty-five other plants were brought here through a horticultural or sentimental urge. In the earlier days, the poplars, spireas, roses, fire-thorn, spindle-tree, ling, lilac, privet, and honeysuckles were introduced from Europe. Later the Asiatics made their appearance: for example, Japanese barberry, more roses, certain spireas, mulberry, tree-of-heaven, Asiatic bittersweet, gumé, kerri-tree, and certain honeysuckles. The white mulberry and the paper mulberry were once widely cultivated and became very popular for silk-worm feeding in the case of the former and paper-making from the latter, when propaganda along these lines was duly broadcast.

As a result of early exploration in our south and west, North American plants foreign to the vicinity of New York were brought northward and eastward and some of them promptly became naturalized. There were different reasons for importing these plants. The majority were grown as unusual horticultural subjects. For example, the prairie rose, golden currant, rose acacia, clammy locust, false indigo, and shrubby trefoil became prominent in gardens.

Plants introduced partly as a result of certain outstanding characteristics include the Dutchman's-pipe, with its heavy foliage and curious flower, honey-locust with its branching thorns and dangling pods, silver-berry with its silvery scaly foliage and berries, Indian-bean with its masses of white flowers and later dangling pods, and the trumpet-vine with its clusters of unusual scarlet flowers.

In the past century the Osage-orange was very popular as a hedge plant on farms. At one time many hundreds of miles of these hedges divided fields on farms, but today relatively few remain. Perhaps the most important introduction from the south was the locust-tree. Once introduced into cultivation, this tree

became the standard source for posts for farm fences. In the middle states every road and lane was lined with this species. When large enough the trees were made into fence-posts and a fresh supply of trees was planted in their places. Thus the locust-tree furnished the posts for thousands of miles of fences on farms. The durability of the wood in contact with soil was its outstanding feature. The hardiness of the tree is another peculiarity. Although a native of the moist forests of the southern Appalachians, this tree is used as a shade tree on the streets of desert towns in western Texas!

That we do not have more naturalized exotics in our local flora is not due to the inability of certain shrubs and trees to distribute their seeds and take hold in new habitats. Many shrubs and trees introduced into our public parks would long ago have established themselves in the vicinity of New York if the possibilities were not limited by a cordon of masonry around each park. For example, there are more than forty Asiatic shrubs and trees naturalized within The New York Botanical Garden, sown there through the agency of birds and winds from specimens planted in the grounds during the early years of the Garden's development, but they cannot spread further. Great development of parkways running far and wide through the open country and planted with many exotics will add to our supply of naturalized shrubs and trees.

JOHN K. SMALL.

INDOOR DISPLAYS OF FLOWERING PLANTS

The seasonal displays of flowering plants in Conservatory Range No. 1 opened in November with an unusually fine collection of chrysanthemums. Close to a hundred varieties, some of which were expected to remain in bloom until late December, were placed on exhibit during the weeks which followed. Meanwhile, in the adjoining house, begonias and many other plants, several of them of species not commonly seen, augmented the floral display.

Last year, between November and June, nearly 7,000 individual pots of plants were placed on view in Houses 5 and 6. In this number 571 species and varieties were represented. At Christmas-time there was a special poinsettia show; during the winter, sev-

eral hundred begonias and numerous tropical orchids were shown. Early spring brought a display of forced bulbs—daffodils, tulips, hyacinths, and others; while at Easter-time, Easter-lilies and other spring-flowering greenhouse plants were exhibited. The exhibits will be similar this year.

In addition to these well-known florists' flowers, a succession of lesser known species and varieties of distinct decorative value, many of which have been added to the Garden's collection in recent years, are being used for exhibit throughout the season.

The two special display houses are open to the public from 10 to 4 every day in the week, including Sundays and holidays. The rest of the greenhouse—containing the cacti and other succulents, palms, economic plants, bananas, and tropical aquatics—is open during the same hours except from 12 to 1 at noon.

WINTER LECTURES AT THE GARDEN

The story of the Botanical Garden's seed-collecting expedition in the Rocky Mountains last summer was told by T. H. Everett, Horticulturist for the Garden and a member of the expedition, in the opening lecture of the winter series Saturday afternoon, December 5, in the lecture hall in the Museum Building.

Other topics scheduled for December, January, and February are listed below. The lectures, which are illustrated with colored lantern slides, begin at 3:30 p.m. and last one hour. They are free to the public.

December 12. "Insectivorous Plants," Dr. John Hendley Barnhart, Bibliographer and Administrative Assistant.

December 19. "Food Plants of the American Indian," Mr. G. L. Wittrock, Docent.

January 9. "Botanical Gardens of the World," Professor F. A. Varrelman, The American University, and Dr. Forman T. McLean, Supervisor of Public Education.

January 16. "Origin and Development of Cultivated Plants," Dr. A. B. Stout, Director of the Laboratories.

January 23. "Use of Chemicals for Propagation of Plants from Cuttings," Dr. A. E. Hitchcock, Boyce Thompson Institute for Plant Research.

January 30. "Switzerland" Dr. Harold N. Moldenke, Assistant Curator.

February 6. "Bananas," Dr. Forman T. McLean, Supervisor of Public Education.

February 13. "Control of Garden Insects, Pests and Diseases," Dr. B. O. Dodge, Plant Pathologist.

February 20. "Bermuda," Dr. Fred J. Seaver, Curator.

February 27. "Foundation Planting," Mr. A. C. Pfander, Assistant Superintendent.

REGIONAL TYPES OF CORN SHOWN IN EXHIBIT

Under the title "Agroecological Regional Types of Corn," an exhibit of corn (*Zea Mays*) has been installed on the main floor of the Museum Building at The New York Botanical Garden, adjacent to the collections of economic plants. The various ecological types of this important American crop plant are shown as they occur in seven regions of the United States, as well as in four other lands where corn is grown.

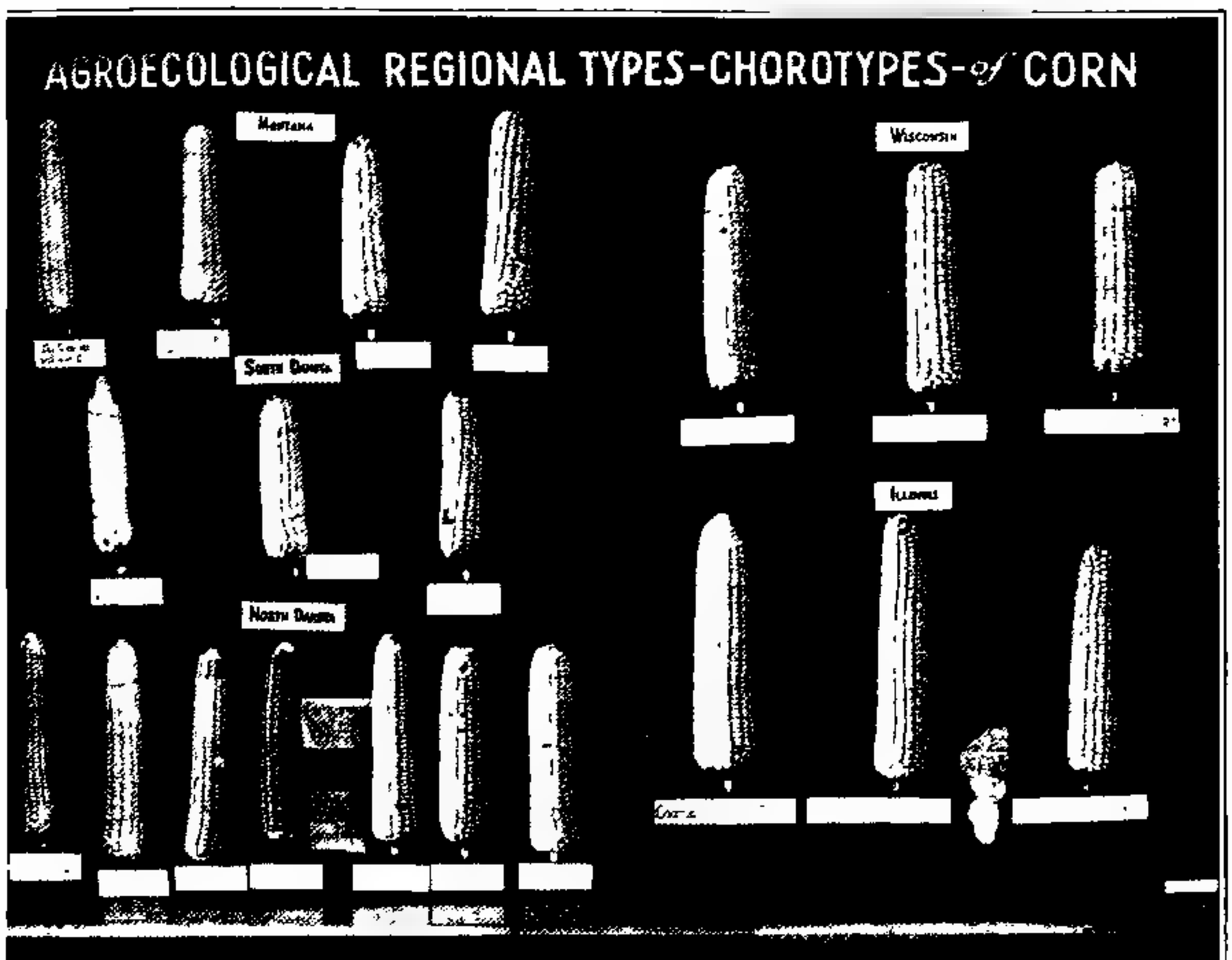
"Definite ecological types of maize grown under certain environmental conditions have been established for various regions by students of corn," according to Dr. Basil M. Bensin, who has been studying corn in Europe, Asia, and America for many years and who, through a project now being conducted at The New York Botanical Garden, has arranged the present exhibits.

"Agroecological types," Dr. Bensin explains, "are those types which are best adapted to the given environmental conditions of a region. They are the result of many years of trials and adaptation of that type to that region, in accordance also with the economic value of the plant, which is indicated by the productivity of that type. These regional types, which are also known as chorotypes, possess the characteristic morphological features of all vegetative organs of the plant—leaves, stems, roots, as well as fruiting body (ear and kernels). The standard height of the plant, the number of leaves, radius of root extension, length of ear, number of rows of kernels, and shape and weight of kernels have been established by agricultural experience and experiment for the various regions of corn culture all over the world."

The collection, which is accompanied by a map of each region specified, contains the agroecological types of corn of the following regions:

(1) *Missouri Plateau Region of North Dakota and South Dakota.* Ten samples; varieties: Eureka, Himple's Yellow Dent, Soft White Corn of South Dakota; Northwestern Dent, Rustler White, Mercer, Falconer, Dakota White, Minnesota No. 13, and Ivory King of North Dakota.

(2) *Montana (Upper Yellowstone River Region).* Four samples; varieties: White Flint, Yellow Flint, Minnesota No. 13, and Minnesota No. 23.



Display cases in the Museum Building containing typical ears of corn from the principal corn-growing regions of the world.

(3) *Upper Mississippi Valley Region of Illinois and Wisconsin.* Six samples; varieties: Gunn Western Plowman, Reid Yellow Dent, and Champion White Pearl of Illinois; Silver King, Golden Glow, and Wisconsin No. 25 of Wisconsin. These are typical corn varieties of the corn belt region.

(4) *Missouri Valley and Platte River Valley of the Great Eastern Plain Region of Nebraska*: Eastern (altitude 1,100 ft. near Fort Calhoun, Neb.); Central (1,930 ft. near Hastings, Neb.); and Western (3,800 ft. near Chappel, Neb.). Types rather than named varieties shown.

(5) *Arizona Irrigated Valleys Region.* Four samples; varieties: Cococino County White Dent, Cococino County Yellow Dent, Cococino Flint, Cream Dent.

(6) *Pacific Region of California.* Five samples; varieties: Mexican June (Imperial Valley Region); Orange County (Region south of Tehachapi); Hickory King (Los Angeles County); King Philip Hybrid (Delta Region); Alameda Sweet Corn (San Francisco Region).

(7) *Atlantic Region of the State of New York.* Five samples; varieties: Long Island Yellow Dent, Champion White Pearl, Champion White Flint, Pop Corn, Sweet Corn.

The samples were obtained by The New York Botanical Garden through the State Agricultural Experiment Stations by courtesy of Professors R. A. Moore and E. D. Holden of Wisconsin; C. H. Dungan of Illinois; R. L. Matlock of Arizona; W. W. Mackie of California; T. A. Kiesselbach of Nebraska; A. N. Hume of South Dakota, and O. O. Churchill of North Dakota.

In addition, the ear samples of the chorotypes of the following regions appear at the exhibit: (1) St. Lawrence Valley region of Canada, (2) Carpathian region of Czechoslovakia and Poland, (3) Andean region of Bolivia and Peru, and (4) the West Indies (Cat Island in the Bahamas).

A GLANCE AT CURRENT LITERATURE*

The old proverb, "Man strides over the earth and deserts follow in his footsteps," has been used as the theme of "Environments and Life in the Great Plains" by Frederick E. Clements and Ralph W. Chaney, published as Supplementary Publication No. 94 of the Carnegie Institution of Washington. The problem of soil conservation—one of the most far-reaching problems before American people today—is approached from a geological, historical, economic, agricultural, ecological, and prophetic angle.

* * *

Soil Conservation is the name of the publication which appears as an organ of the Soil Conservation Service of the United States Department of Agriculture. Under the editorship of Wellington Brink, phases of the problem and their possible solutions in all parts of the country are treated. The October number gives, among other things, the story of Golden Gate Park in San Francisco as an example of an effort to reclaim waste land.

* * *

Estimates of losses in 20 important crops of grain, fruit, and vegetables in the United States during 1936 are given in Supplement 94 of the *Plant Disease Reporter*. As an example, six diseases claimed more than 226 million bushels of wheat, or 32.6 percent of what the crop might have been.

* * *

The fringe-lipped orchid, *Brassavola (Laelia) Digbyana*, has apparently only been shipped three times from the wild in British Honduras for cultivation in England—first when it was discovered in 1845, then in 1879, and again in 1935. The story of the second shipment—concerned with mahogany forests and buried golden images—is told in the October number of *The Orchid Review*.

* * *

Vegetative characters are used as a basis for the "Key to the Grasses of Montana" by C. Leo Hitchcock, published at the University of Montana. Finely detailed drawings of the vegetative parts of nearly 200 species are reproduced.

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* All publications mentioned here—and many others—may be found in the Library of The New York Botanical Garden, in the Museum Building.

"The Lichen Flora of the United States" by Bruce Fink, late professor of botany at Miami University, Oxford, Ohio, has been completed for publication by Joyce Hedrick, who worked under Professor Fink before his death in 1927 and later, as instructor in botany at Miami University, continued work on his manuscript. The Fink herbarium is now in the possession of the University of Michigan, where Miss Hedrick (Mrs. Volney H. Jones) is a member of the staff. The work has been prepared with the underlying idea that lichens, although treated as a group, could be distributed among the other fungi, or, in Professor Fink's own words: "The lichen is a fungus which lives during all or part of its life in parasitic relation with the algal host and also sustains a relation with an organic or inorganic substratum." The book, which contains 426 pages, is illustrated with drawings and photographs. It is published at Ann Arbor, Mich.

* * *

W. F. Christman, Secretary of the American Peony Society, gives valuable hints on cultivation and pointers for wise selection of varieties of peonies in the *Gardeners' Chronicle of America* for August.

* * *

Bulgaria produces three fourths of the world's supply of attar of roses, making it from the petals of *Rosa damascena* and *R. alba,* which are grown in small plots by the peasants. The industry is described by Henry J. Bruman in *Economic Geography* for July.

* * *

Among the Ethiopian plants in which Italy is expected to take an interest, according to the *Rivista Italiana delle Essenze, dei Profumi, e delle Piante Officinali,* is *Brayera* (*Hagenia*) *abyssinica,* which is valued for its use as a drug. This is a dioecious tree of the Rose Family, the female inflorence of which yields an anthelmintic. The native name for it is kusso.

* * *

South African succulent plants at Kew Gardens in England are now being shown to the public for the first time in a new 67-foot display house which was constructed with funds donated in commemoration of the King's Jubilee in Great Britain last year. Naturalistic settings are being used for the displays, according to an announcement in the *Gardeners' Chronicle.*

More than 350 million trees have been planted by official bodies in China since 1929, according to a recently published report on reforestation made by the head of the National Forestry Bureau of China. Various student bodies did volunteer work as an aid in this great planting program.

* * *

"Revision of the Genus *Coreopsis*" by Earl Edward Sherff has appeared as Publication 366 of the Botanical series of the Field Museum of Natural History. Many species of *Corcopsis* have herewith been transferred to *Bidens*, a few to other related genera, while one, (*C. cordifolia*) the type of which was recently examined in Madrid, is declared to be a hitherto unrecognized species of *Dahlia*, to which the name *D. cardiophylla* Blake & Sherff has been given. Dr. Sherff's revision of the genus *Cosmos*, which is part of the same prolonged study of these related genera, was published in 1932 and will be concluded in a subsequent treatment in *North American Flora*.

CAROL H. WOODWARD.

NOTES, NEWS, AND COMMENT

The first lecture account of the Garden's Rocky Mountain expedition of last summer was given by T. H. Everett before the Westchester and Fairfield Horticultural Society in Greenwich, Conn., Tuesday evening, November 10. Garden clubs of the district were the guests of the society for the evening. The lecture was illustrated with colored lantern slides showing some of the rare plants of which seed was gathered and the mountains where the collecting was done.

* * *

The second batch of seeds collected on the Rocky Mountain expedition was sent out from the Botanical Garden last month. In October, seeds of 28 species of plants were shipped to subscribers, while last month 35 more different kinds were sent. Subsequent parcels will contain seeds of 63 additional species to be propagated principally for rock-garden use.

* * *

Miss Eileen Elizabeth Fisher of the University of Melbourne, Australia, recently visited the Mycological Herbarium of The New York Botanical Garden. She is just returning from England where she has spent some time in study at Cambridge.

During November Dr. A. B. Stout spent several days in Maine with Dr. E. J. Schreiner in a survey of the project with hybrid poplars which has been conducted by the Oxford Paper Company with the coöperation of The New York Botanical Garden. Dr. Schreiner is now a member of the United States Forest Service, in charge of the breeding of forest trees.

* * *

Norman Taylor, formerly a member of The New York Botanical Garden's staff, has recently been awarded a gold medal by the Massachusetts Horticultural Society in recognition of his work in editing "The Garden Dictionary." This volume was "considered to be the most notable horticultural book which has appeared in America in recent years," according to the letter in which the award was announced. Other medals were awarded to Elmer D. Smith, chrysanthemum grower, of Adrian, Mich., Harlan P. Kelsey, nurseryman, of East Boxford, Mass., and Robert M. Grey, retired superintendent of the Arnold Arboretum's garden in Cuba.

* * *

Dr. W. H. Camp left New York December 4 for a three months' collecting trip in Mexico, chiefly in the State of Oaxaca.

* * *

A winter exhibit of gourds and Indian corn has been placed on the main floor in the Museum Building through the courtesy of Miss Helen M. Tillinghast.

* * *

The stone-work for a fence which is to surround the area south of the Thompson Memorial Rock Garden was completed in November.

* * *

A heavy frost the night of October 26 ended the dahlia season at The New York Botanical Garden. About 1,100 plants had been on display, representing more than 400 varieties. Roses, which had been in excellent autumn bloom, also succumbed to the rigors of the weather. Continued cold on the following day affected many of the early blooming chrysanthemums, killing some to the ground, but merely taking the open blossoms of others. Two weeks later, many of these were in full bloom again, and by mid-November the late varieties, whose young buds had been unharmed by the frost, were making a colorful display.

REVIEWS OF RECENT BOOKS

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

Adventures with Hardy Bulbs

It is probably an understatement of the case to say that at least three quarters of the gardening books that have been inflicted upon the public during recent years would have been better left unwritten. From a constant flow of trash it is not always easy to filter the worth-while, but the name of Louise Beebe Wilder appearing on the cover is itself a welcome signpost to those who know their authors. In her most recent offering* Mrs. Wilder has not proved disappointing. Indeed, to my mind, this book surpasses any she has previously written. In it she has brought together a tremendous amount of information in a field in which there has long been need for a comprehensive work. While she has based her writing primarily upon her own accomplishments—not forgetting her occasional failures—she has also drawn upon other sources of knowledge, such as the experiences of other reliable growers and the wealth of material buried in horticultural and botanical libraries. Not since Reginald Farrer has a garden author produced such easily read material as Mrs. Wilder.

For one thing, she does not give directions in the conventional manner of saying, "First do this, and next do that." Rather she explains what bulbs are and how they should be handled in such a way that the beginner will welcome her picturesque clarity, while the experienced gardener will recognize her soundness and will relish her entertaining paragraphs.

In the body of the book she deals with forty genera of hardy bulbs, often describing many species in each, all in a style that is at once scholarly and intimate.

The book is admirably illustrated with fully 100 flower photographs of exceptional quality, besides a score or more of drawings, all by her son, Walter Beebe Wilder.

The hope expressed in the introduction (which is aptly titled "Propaganda") that this book may be a "pleasant and stimulating companion" along a path that the author has found "increasingly interesting and rewarding" will surely be fulfilled for every reader.

T. H. Everett

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* Wilder, Louise Beebe, Adventures with Hardy Bulbs. 363 pages, illustrated. Macmillan, New York, 1936. $5.

The Wild Garden

Margaret McKenny's little volume* is a practical handbook to the first steps in establishing a wild garden. The author throughout has stressed the importance in such gardens—a point that is all too often omitted—of choosing plants so that they form a natural unit of vegetation. We therefore expect—and find—chapters dealing with specific habitats such as open sunny banks, ponds, woodlands, and others, including that most difficult place to establish a wild garden, the seaside.

A list of species particularly adapted to each habitat is appended at the end of each chapter. While the plants mentioned are mainly those of the northeast (southern New England, eastern New York and New Jersey), additional lists of valuable plants south and west of this area as well as selections for Oregon and Washington are to be found.

Another important point that is thoroughly emphasized is that the wild plants should not be torn ruthlessly from the woodlands, but where possible should be purchased from dealers who grow their own stock—or, better yet, raised by the gardener himself from seed or by vegetative propagation. Consequently, there are six chapters devoted to the various methods that can—and in certain cases must—be used to insure a successful and adequate supply of planting material.

Altogether it is a very helpful little book and so delightfully written that those who live in apartments must envy those who can watch for the first bloodroot to shed its petals on soil made deep and rich with the labor of their own hands.

W. H. Camp

On House Plants

Written as a personal record by one who started gardening with a sword fern, and who has since graduated to begonias, bulbs, and even gloxinias, Mrs. Buxton's little nine-chapter guide† is meant for the novice at indoor gardening to enjoy. The professional will not agree with all Mrs. Buxton says—such as the fact that begonias and geraniums should be grown "on the dry side;" and botanists may argue that *Marica* is not a "tropical variety of the iris," since it is a *genus* of the Iris Family. However, on the whole, Mrs. Buxton covers the fundamentals for the beginner who longs for decorative foliage and flowers in the windows.

A third of the book is taken up with rules for the care and propagation of house-plants; more than a third with geraniums,

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* McKenny, Margaret, The Wild Garden, 123 pages, illustrated. Doubleday, Doran, 1936. $1.

† Buxton, Bessie Raymond, The Window Garden. 158 pages, illustrated. Orange-Judd Publishing Company, New York, 1935. $1.50.

begonias, and bulbs; and the remainder with random notes, largely on unusual plants, with a well-illustrated chapter on hanging pots.

CAROL H. WOODWARD

TREES OF THE FAR WEST

A comprehensive book treating of both native and cultivated trees found on the Pacific Coast, McMinn and Maino's treatise* contains good plant descriptions. Though they may be too technical for popular use, in many instances distinctive leaf or twig characters help to differentiate species, both in keys and in individual descriptions. In many of these, if the distinctive characters were emphasized by italics, it would make the book more effective. Its most useful feature is the excellent set of drawings, illustrating most of the species described. With few exceptions, these are sufficient to identify the species, where its family and generic relationships are known or can be easily determined by the use of the key. As a field book for ready reference it has in some instances the all too frequent fault of depending on flowers or fruits for identification—and these are apt to be available during a rather brief period each year. The major divisions, however, are based on leaf characters and are easily followed. Comprising as it does clear drawings and fair descriptions of all of the commonly occurring trees, both native and introduced, on the Pacific Coast, it will serve as a useful guide for students of trees in forest, nursery, or city.

FORMAN T. MCLEAN

SHADE-TREE PESTS

For home-owners and other people wanting to protect their trees from the ravages of insect pests, Professor Herrick has written a useful guide in his "Insect Enemies of Shade-trees."†

There is an especially good chapter on spray materials and how to use them, in which both the average man and the professional gardener will be gratified to learn that they may use gold-dust instead of the foul-smelling fish-oil soap which is usually recommended for the soap ingredient of nicotine sprays.

The photographs and drawings provide clear illustrations of a large number of harmful insects and of the damage they do to shade-trees. Some readers may criticize the insertion of purely decorative pictures of well-known trees, preferring to see more illustrations of the insects that injure them, but such photographs

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* McMinn, Howard E. and Maino, Evelyn. An Illustrated Manual of Pacific Coast Trees. 409 pages, illustrated. University of California Press, Berkeley, 1935. $3.50.

† Herrick, Glenn W., Insect Enemies of Shade-trees. 417 pages, illustrated. Comstock Publishing Company, Ithaca, N. Y., 1935. $5.

seem appropriate in a work of this kind. While the book is not exhaustive, it treats the major pests and will give excellent service to both the home gardener and the professional man who heed its directions.

B. O. Dodge

Bigger and Better Roses

C. F. Mappin, an amateur rose grower in England, has produced a little book on rose-growing* principally for amateurs.

In the main, the book has much to recommend it to the beginner, especially the chapters on planting, pruning and feeding. There is much, however, that will have to be accepted with discretion in the light of our American conditions. The practice which the author advocates of thinning out the growth and of applying bone-meal and wood ashes in November is of doubtful value here, nor can we accept his advice that roses should have no winter protection.

The chapter on varieties leaves a feeling of incompleteness, as there is no attempt to discuss important types or to mention names. With a frank discussion of the merits and demerits of several outstanding varieties the author could have provided some valuable advice for the beginner. He warns, and rightly too, against the unscrupulous nurseryman and against the danger of so-called novelties.

Being a successful exhibitor, the author discusses exhibiting at some length, and while he indicates that he is addressing the inexperienced only, there is much in his information that would be helpful to the experienced amateur also.

The book is refreshing in its exposition of the author's departure from some old-time practices after he became convinced that they were the cause of many of his earlier failures. He had the courage to revise some of them and to proceed along other lines, and his success as a rosarian fully justifies the course he took. It is not that he has discovered anything new in rose-growing, but rather that he has used a sound reasoning and judgment with a good understanding of the principles underlying his methods.

The book contains much that can be helpful, but at the same time much that is inapplicable, particularly in places where the winter is severe and where the summer is hot and dry.

It is just another instance to prove that attempts to revise European books to fit American conditions, though fundamentally good, can seldom be wholly successful.

P. J. McKenna

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*Mappin, C. F., Bigger and Better Roses. 155 pages, illustrated. Robert M. McBride & Co., New York, 1936. $2.

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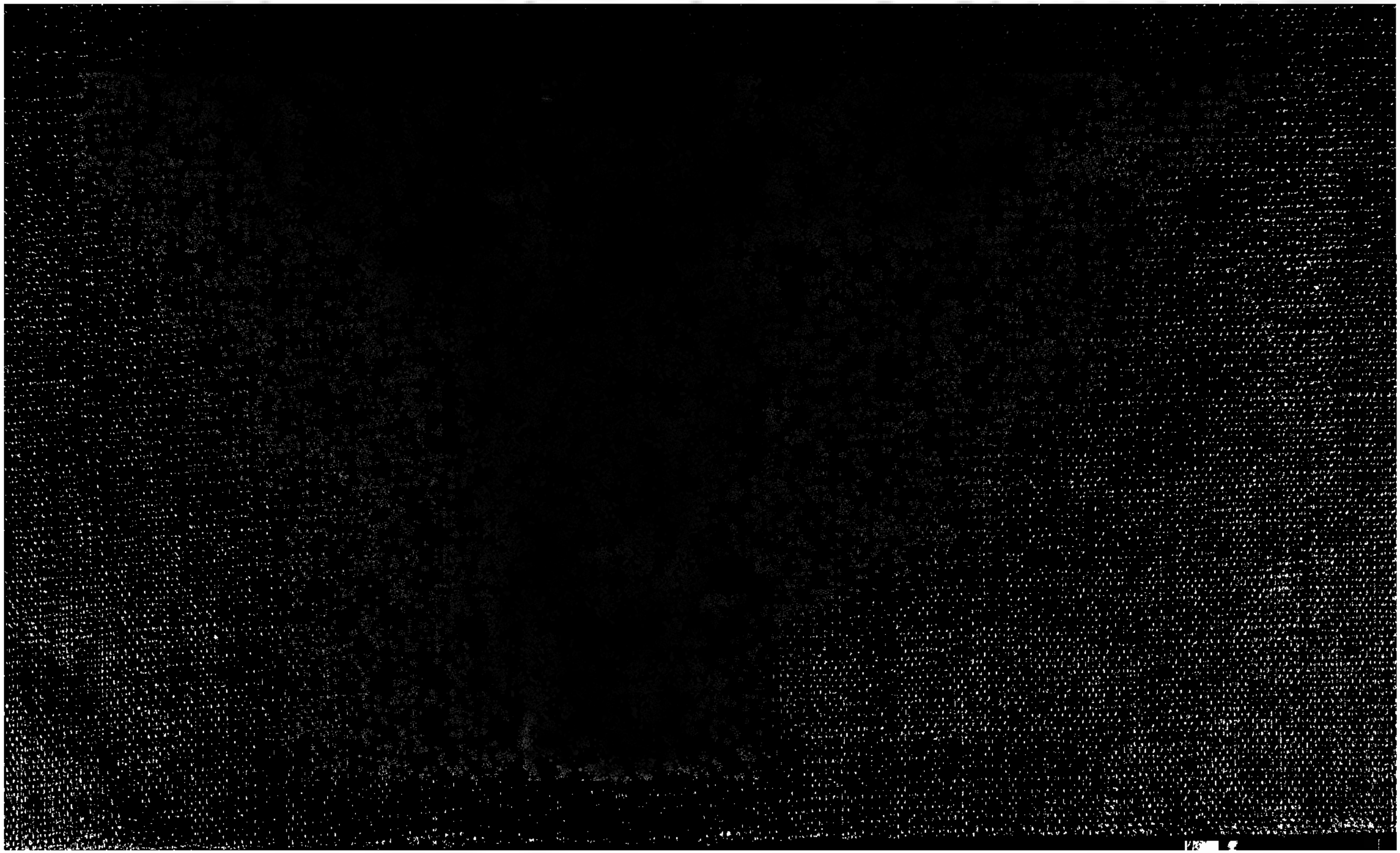

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CAROL H. WOODWARD
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Fellowship Member	annual fee	100
Member for Life	single contribution	250
Fellow for Life	single contribution	1,000
Patron	single contribution	5,000
Benefactor	single contribution	25,000

Contributions to the Garden may be deducted from taxable incomes. The following is a legally approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ————————.

Conditional bequests may be made with income payable to donor or any designated beneficiary during his or her lifetime.

All requests for further information should be addressed to The New York Botanical Garden, Bronx Park, New York, N. Y.

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Anemone occidentalis in fruit, Glacier National Park.

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

JANUARY, 1937

REPORT OF THE ROCKY MOUNTAIN EXPEDITION—I.	Edward J. Alexander
VEGETATIVE PROPAGATION OF DAYLILIES	A. B. Stout
EVERY GARDEN MEMBER TO RECEIVE ADDISONIA	
STAFF MEMBERS SPEAK AT ATLANTIC CITY	
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LEWIS RUTHERFURD MORRIS	
WILLIAM HENRY CARPENTER	
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EXPLORATION

The sciences of both botany and horticulture are served by exploration such as that which is sponsored by The New York Botanical Garden. Ever since the Garden was established some 40 years back, its men have gone far into the field to increase the world's knowledge of plants and to bring back new specimens for gardens. Expeditions into all parts of the North American continent, as well as the adjacent islands and northern South America, have resulted in many hundreds of new species of plants being discovered and made known to the scientific world. Each one of these has been a contribution to the greater understanding of the science of botany---revealing new relationships between plants, divulging variations in their species, unfolding problems of ecology (their habitat and its associations), of morphology (their structure), genetics (their inheritance), and taxonomy (their classification).

In more recent years, horticulture has played an increasingly important part in expeditions sent out by the Garden—in 1933 to the southern Appalachians, in 1936 to the Rocky Mountains. As a result, scores if not hundreds of heretofore little known plants are now being tested in many places for future garden use. Collaborators of The New York Botanical Garden in many parts of the world are also continually sending back specimens, both for botanical use and horticultural trial.

Each expedition in turn has been made possible by special contributions for the purpose of exploration, offered by men and women who understand that today's scientific discovery becomes tomorrow's useful knowledge, and that today's collection of plants will enrich tomorrow's gardens.

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It is with great regret that we record the death, on December 24, of our Director, Dr. Marshall A. Howe. An account of the life and achievements of Dr. Howe will appear in an early number of this Journal.

REPORT OF THE ROCKY MOUNTAIN EXPEDITION

I

Responding to the keen interest evinced in recent years in alpine plants of the Rocky Mountains for rock-garden use in both America and Europe, The New York Botanical Garden in the summer of 1936 sponsored a seed-collecting expedition in the West.*

Selecting as direct a westward route as possible, we left New York in a well-packed truck during the hot spell of early July, and in less than two days crossed New Jersey and Pennsylvania. Then for five days we rolled across the plains. Five long hot days they were, the only scenery being burnt grass, a few scorched weeds, and many bare stems where crops and weeds would be but for the all-devouring grasshoppers. Grasshoppers, yes—they were all too present, constantly splattering themselves on the windshield or sides of the car, and frequently landing in our faces or laps, and at night we took a whisk-broom and brushed their burnt remnants from the radiator, thereby making room for more. The temperature registered in the towns around us was from 108 to 118 degrees, a burning heat with no trace of humidity—like a

* The expedition consisted of T. H. Everett and the writer, with two student gardeners, Stephen G. Cutting and Martin J. Crehan, serving as assistants during separate periods. The trip was made possible through a limited syndicate, the members of which receive a pro-rata share of the seeds of the rock-garden plants collected. The group consisted of patrons of horticulture (including several botanical and horticultural institutions) in America and Europe.

furnace blast. Our one pleasant sight on this part of the journey was a series of ponds filled with American lotus, *Nelumbo lutea,* near the Mississippi River in Illinois just before we crossed into Iowa.

On the sixth day in extreme southwestern Nebraska we came to our first interesting plants, the large white-flowered *Argemone intermedia,* and the bush morning-glory, *Ipomoea leptophylla,*

FIGURE 1. A prickly beauty of the Cheyenne plains—*Argemone hispida.*

easily recognized by its long linear leaves. Shortly afterward we found several large fields of *Eustoma Russellianum,* a handsome relative of the gentians. On some low hills nearby we collected seed of the gray-leaved dwarf crucifer, *Lesquerella ludoviciana.*

We crossed the Wyoming state line, and before long the first ridges of the Rockies showed faintly in the distance, the range broadening slowly until it formed the entire western horizon just before we arrived at Cheyenne. Outside of Cheyenne was obtained seed of a densely cushioned *Arenaria* with loose heads of white flowers. Near town we found our first *Eriogonum,* an attractive one with six-inch flower-stalks topped by bright yellow umbels.

Here also was a white *Argemone, A. hispida,* by far the finest we ever saw, its blue leaves and snow-white flowers startlingly beautiful in the early morning light, but the entire plant was armed with dense thorns of assorted sizes which were painfully annoying when the plant was handled. Farther out of town in a gravelly gully we obtained seed of *Scutellaria Brittonii,* a large-flowered dwarf species.

Now we started the slow uphill grade of the first range of the Rockies, the Laramie Hills. Several stops were made for notes and specimens, and a number of plants in flower were recorded for later seed collections. At the summit of the range we stopped for the night and next morning went into a nearby glen to see what sort of region we were in. Many thickets of *Purshia tridentata, Ribes inebrians* and *Jamesia americana* were there, and we collected seed of the two former, the *Jamesia* being just past flower. *Purshia* is a shrub 2 or 3 feet tall, belonging to the Rose Family. It has an angular spreading form with small three-partite leaves, and is covered in season with small light-yellow flowers. *Jamesia* is a member of the Saxifrage Family, forming a dense rounded bush with small obovate leaves and many terminal clusters of white flowers.

From the summit lookout tower could be seen the Medicine Bow Mountains back of Laramie, and to the south the main chain of the Rockies culminating in Rocky Mountain National Park, both ranges still well streaked with snow banks. Since the Medicine Bows were nearest, there we headed, descending first to the Laramie Plains where we found several colonies of the little white-flowered, narrow-leaved and cespitose *Penstemon exilifolius* still in bloom, and in the foothills of the mountains a fine purplish-red *Oxytropis* in full flower. We pitched camp at about 9,000 feet elevation in the pine forest. Along the road winding to the top of the range, we collected seed the next day of *Corydalis aurea,* a low-growing, perpetually flowering plant, but apparently only an annual. Higher up were several colonies of *Allium brevistylum,* a handsome rosy-purple-flowered species which at a distance appeared like a long-stemmed *Armeria.* Before long we entered the zone of subalpine meadows and here saw our first example of their riot of flowers. All around were splashes of the rich cream color of *Eriogonum subalpinum* and of the blue and purple of *Penstemon procerus* and *P. Whippleanus.* Interspersed were the

tall slender stems of *Calochortus Gunnisonii,* each topped by a white and lavender cup. In the boggy sections we first saw *Pedicularis groenlandica* and *Gentiana elegans.* All of these plants were to be our constant companions at subalpine elevations. On the open stony flats just below timberline we made our first acquaintance with *Geum turbinatum,* that prime pioneer plant of the central Rockies, with ferny leaves and golden flowers, which manages to find a foothold any and everywhere and to survive through all competition and hardships. On these flats, seed of *Lewisia pygmaea,* dwarfest of its genus, was collected. The exceedingly handsome, bright purple dwarf *Erigeron simplex,* then in flower, was noted for future collecting. Descending to our camp, we found along the way the dark blue *Delphinium Barbeyi* and the handsome lavender-pink *Erigeron elatior,* both too large for rock-gardens, but with splendid promise as border plants.

Returning to Laramie, we went south into Colorado, finding along the way our first colony of *Penstemon unilateralis,* a tall blue or purple species, worthy as a border plant. Arriving at Loveland, Colorado, we went up the tortuous windings of Big Thompson Canyon to Estes Park, and up the Trail Ridge road to near timberline, where, in order to see the alpine flora, we ascended a grassy ridge rising above treeline. Climbing along a line of melting snow-banks we found *Sedum integrifolium,* a dark-red-flowered succulent of no special garden merit but interesting, and right against the melting snow, hundreds of flowers of that most glorious of American buttercups, *Ranunculus adoneus,* its two-inch cups of gold set above thread-cut leaves. All over the upper ridge were great quantities of the cespitose *Trifolium dasyphyllum,* its white and pink heads dotting the landscape.

Our next objective was Longs Peak in the southeastern corner and the highest peak in the Park. At the inn at its foot, we were told that six to eight hours was average time for the round trip. That time, however, was for the hiker whose only objective is the 14,255-foot summit, not for the botanist whose interest is in every plant along the way. Little new was seen below timberline, but immediately above it Nature strove for effect. It seemed that over every rock was draped a plant of *Potentilla fruticosa,* and under the edge of each rock was a mat of *Saxifraga austromontana.* At one place everything seemed smothered with *Eriogonum xanthum,* at others *Dryas octopetala* or *Erigeron melanocephalus*

FIGURE 2. Mid-July in the Wyoming Medicine Bows. Here the high alpine ridge is seen rising above the flower-adorned subalpine flats.

ran riot, with the golden flowers of *Geum turbinatum* omnipresent and always a fine sight. Large mats of *Salix petrophila* spread over the moist banks, and as we rose higher, the low golden tuffets of *Tonestus pygmaeus* and *Tetraneuris lanigera,* both desirable composites, dotted the alpine flats. High up on the shoulder of Longs Peak is a nearly level flat where tumbled masses of huge boulders slow down one's progress: The Boulder Field it is called, and under the rocks one hears the constant purr of invisible water. Among these apparently barren rocks are frequent tussocks of grass and sedge and in these tufts are occasional plants of *Saxifraga chrysantha,* its golden cups held up to greet the passerby, who, upon looking more closely is surprised to see flecks of blood in its heart. Here also grows that tiniest of American campanulas, *Campanula uniflora,* with a single nodding indigo-blue flower, and an occasional plant of *Gentiana prostrata,* its clear cerulean flowers closing at the lightest touch.

Our notes made, we departed to visit Pikes Peak, more than a hundred miles to the south, near the town of Colorado Springs. Pikes Peak is nearly 150 feet lower than Longs, its bulk is more

easily accessible by reason of an auto road, and certain desirable plants grow there in greater profusion. On the way up we found large patches of *Penstemon alpinus* and of the silvery leaf-rosettes of *Physaria didymocarpa,* each one surrounded by a ring of inflated pinkish seed-pods; but the real beauties did not start until just below timberline. While waiting for our engine to cool, we wandered away to explore an interesting-looking cliff. Between the stones of its talus-slope and all up into the lower crevices were colonies of the cerise-flowered *Boykinia Jamesii.* In a meadow nearby was a small colony of *Penstemon Hallii,* a dwarf rosy-purple one that should be a prize. Higher up on the cliffs a small amount of seed of *Aquilegia saximontana* was found.

Taking the tortuous road to well above timberline, we parked to explore an inviting ridge and deep valley. Almost at once we found quantities of the very dwarf *Thlaspi coloradense, Trifolium dasyphyllum* and *T. nanum,* the last a completely prostrate plant with two- to three-flowered heads of rosy purple. On the far side of the ridge we were astounded to find drifts of *Saxifraga chrysantha* and *Silene acaulis* all in between the rocks; pink and yellow are not supposed to combine well, but Nature follows no rules and here was a job any gardener would have been proud to call his own. Down into the valley we went, and found it a veritable alpine garden. Scattered over the slopes were drifts of *Campanula rotundifolia* var. *petiolata,* and *Androsace carinata,* whose tiny rosettes look like some saxifrage until the fragrant white, yellow-eyed flowers appear. The moist pockets and flats were filled with *Swertia scopulina,* a dull-blue-flowered relative of the gentians, and *Sedum rhodanthum* with terminal spikes of light pink. Returning to the road, we examined some nearby wet flats where *Caltha rotundifolia* grew, and found quantities of that tiniest of American primroses, *Primula angustifolia,* with one solitary flower on each of its several stalks.

Due to the lateness of the hour, we returned to Colorado Springs and came back in the morning to try the higher slopes. The higher we went, the more plentiful became *Saxifraga chrysantha;* all apparently barren slopes seemed covered with it until at about 13,500 feet it abruptly stopped. Just below the summit cone we walked off to explore the apparently barren slopes above the "Bottomless Pit." They were all covered with *Mertensia alpina,* a dwarf, nearly prostrate plant with intense blue, forget-

FIGURE 3. Looking up Chasm Gorge to Longs Peak three miles away. This towering mountain, which here rises 3,000 feet above the apparent base at the head of the gorge, in Rocky Mountain National Park, Colorado, is one of North America's finest and most rugged alpine regions.

me-not-like flowers; *Eritrichium argenteum,* with silver-haired foliage and deep blue flowers; *Saxifraga chrysantha* and *S. flagellaris; Trifolium nanum* and *Claytonia megarrhiza,* this last a great disappointment after seeing its Lewisia-like foliage to find that it bore only small white flowers with pink veins.

Leaving the Pikes Peak area behind we now turned toward the Hoosier Pass region in the great gold-mining district, for here we had been told was one of the best alpine regions in Colorado. At Woodland Park just north of Pikes Peak we obtained seed of *Thermopsis divaricarpa,* a foot-high plant with short wands of golden flowers. Then started a wild ride across the mountains to the town of Fairplay. A violent rainstorm came up, and through many a puddle we splashed, even going off the road on the slippery clay, until we finally seemed to reach the end of the world. The road ahead ended in a blind mist . . . South Park, a sign read—and we knew that below us lay that great intermontane valley, into which the slippery road zigzagged. Through the town of

Como we splashed only to emerge and enter another puddle—Fairplay. Peering through the driving rain we found an auto camp, and stopped to rest our bedraggled bones and clothes for the night.

Up early the next morning we watched the mists rise from the encircling peaks and then started for Hoosier Pass six miles away. In the valley beyond the town of Alma we stopped to admire the deep blue spikes of *Aconitum Bakeri* and numerous patches of *Dodecatheon,* as well as an attractive *Antennaria* with silvery-yellow flower heads. On top of Hoosier Pass a driving hail storm forced us to return to Fairplay, where we inquired about the habits of the weather. "Oh, it has been raining every afternoon for two weeks," was the answer, and we knew then we must get into the pass and out before noon in order to locate our plants. Late that afternoon, a lull in the rain allowed us to take a short trip to the west of town, where we found large colonies of *Kentrophyta aculeata* and saw the finest patch of *Pedicularis groenlandica* we were ever to see—a ten-acre meadow one solid sheet of rose-purple.

The next morning we started out at daylight and went straight to Hoosier Pass. The day before, as we ascended, we had noticed the side valley out of which tumbled the new-born waters of the South Platte, and to that valley we turned our attention. Looking far up to its head, we could see the gray stone walls of the 14,000-foot range guarding the west side of the pass and rising well above it. We parked our car in a pasture at the foot of the valley and, setting out on foot up an old mine road, soon began to find things. First was a small patch of *Saxifraga Hirculus,* each of its six-inch stems topped by several golden flowers. Next was a patch of the rose-colored *Allium Geyeri.* Erigerons of many species were all about, most beautiful of all being the same lavender-pink one we had previously seen on the Medicine Bow. As we approached timberline the silence was broken by the howling of coyotes whose dens were in the cliffs above us. The timberline meadows were a mass of white with the golden-centered chalices of *Caltha rotundifolia* and the smaller white and dark-streaked bells of *Lloydia serotina.* Everywhere were great clumps of *Castilleja lauta,* its beautiful rose-colored bracts making one wish the plant's parasitic tendencies did not prevent its becoming a garden embellishment. Climbing still higher along the rocky stream-banks we found the rocks draped with the golden flowers of *Mimulus guttatus.*

FIGURE 4. The wet alpine flats in Logan Pass, Glacier National Park, with Mt. Oberlin commanding the scene. The large clumps of plants in the foreground are of the pink-flowered *Mimulus Lewisii.*

Up the last grade we toiled to the lake from whose waters the South Platte seems to take its source, and here lay before us a breathtaking spectacle—all available space along the stream banks and lake shores was one mass of rose-purple—*Primula Parryi,* that most lovely of American primroses; and far up the rocky slopes were long drifts of the pale-yellow *Anemone zephyra* and the snowy *Cardamine cordifolia.* Far above nodded the blue and white flowers of *Aquilegia coerulea,* and mertensias of various species hung their great clusters of blue bells all around, while down the ledges cascaded an icy stream. There appeared to be another flat above, and while two members of the party collected seed of *Trollius albiflorus,* the third climbed up the ice-sheeted ledges along the stream and emerged onto a soggy meadow. Back against the final ridge-wall was another lake, the true source of the South Platte, for it was fed by the melting snow banks of the granite walls. The meadow up here was dotted with *Swertia, Castilleja, Tonestus, Sedum, Gentiana, Primula,* and many grasses and sedges, but not in the spectacular quantity seen at the lower

lake. Gathering clouds soon forced us to descend, and before we were half-way down, a violent sleet storm overtook us, and we reached the car a bedraggled but triumphant trio.

Through the now pouring rain we went on over the pass by the road and down into the valley of the Blue River, one of the forks of the Colorado. Approaching the town of Breckenridge we examined all sagebrush flats, and finally located another much-desired plant, *Lupinus caespitosus*. We secured only a few seeds here, but the next day near Dillon found larger quantities and so filled out our quota. These seeds were not the easiest to obtain, for they had shattered into the sand, so that we had to lie flat on the ground and pick out the pinhead-size seeds one at a time. This species is not like any lupine in cultivation. A dense clump of leaves about three or four inches tall is formed and down in their midst are several two- or three-inch sessile spikes of small blue flowers.

From Dillon we turned eastward across Loveland Pass, which is flanked on one side by Grays Peak and on the other by Torreys, both classical botanical localities. On down the valley through the half-abandoned mining towns of Silver Plume and Georgetown to Empire we traveled, thence northward across Berthoud Pass and into the little town of Granby. Going from here through Willow Creek Pass back into Wyoming, we found along the way some large colonies of *Penstemon caespitosus,* a prostrate, mat-forming species with small, leathery, shining leaves and rosy-purple flowers.

At Laramie again, we visited Dr. Aven Nelson at the Rocky Mountain Herbarium and obtained localities for some rare penstemons we had not previously found. One of these, *Penstemon acaulis,* had been discovered by Dr. Louis Williams only in 1932, so we now turned to its one known locality in extreme southwestern Wyoming. Another drenching rain greeted us even in this "desert" region. After it ceased we started searching over the stony hilltops. Late in the afternoon, across the state line in Utah, we located what we believed to be our plant, but it was nearly dark before we had found the seed capsules which confirmed its identity and thus added a second locality and state to its known range.

Then we headed northward toward Yellowstone Park and the Teton Mountains. Passing along the Hoback River flats we found a handsome-leaved lupine, and further along in Hoback Canyon

another rare *Penstemon, P. montanus,* a low shrubby species with thick ovate leaves and large old-rose-colored flowers that resemble a Mimulus more than a *Penstemon.*

Leaving the Tetons and Yellowstone for the return trip we hurried on to Glacier National Park in far northern Montana. Here the backbone of the Rockies comes down out of Canada, and the mountains, though mostly less than 10,000 feet in elevation,

FIGURE 5. *Gentiana calycosa,* one of the most beautiful of American gentians, as found in Glacier National Park.

rise like fortress walls, too steep for any but low vegetation. Here too, many northern plants find their southern limits and far western plants their eastern limits. The western slopes of the Park are mostly covered with a wonderful growth of various conifers, most beautiful of all being *Thuja plicata,* a huge forest tree with long drooping branches that appear like filigree-work against the sky. Another notable plant of the deep forests here is *Echinopanax horridus,* with large palmate leaves and terminal panicles of red berries, quite exotic-looking in this setting. All over the open glades of the forest were the tall spires of *Xerophyllum tenax,* but on the upper slopes of the mountains, on

cliffs, rock slides, and glacial detritus the alpines held sway. Grassy slopes were adorned with the tall-stalked silvery-green fruit heads of *Anemone occidentalis*. Many rocky flats were covered with dense growth of *Phyllodoce empetriformis, P. glanduliflora,* and *Eriogonum Piperi*, and where a ground cover of grass had formed, *Kalmia microphylla* held its chestnut-colored capsules into the air, while all around were ripe capsules of *Erythronium grandiflorum* telling a tale of the earlier season's glories, when its yellow flowers had nodded on every grassy slope. Scattered plants of *Gentiana calycosa* held their blue chalices up to the sun, rivaling the autumn sky in color, while over along the rocky water-courses *Mimulus Lewisii* ran riot, great clumps of it covered with large rose funnels waving in the winds, while beneath it the smaller plants of *M. guttatus* studded the ground with spots of gold, and in between the fringed cups of *Parnassia fimbriata* rose on long slender stalks. Dripping ledges held solid mats of *Saxifraga Lyallii* and *Leptarrhena pyrolifolia,* while higher on the moraine heaps were clumps of *Penstemon ellipticus,* its deep lavender funnels waving a wild welcome—and most lovely of all, the unbelievable silver mats of *Eriogonum depressum,* its rose and silvery-yellow heads on hatpin-like stalks appearing unearthly in those rocky wastes. Here also the two-inch plants of *Papaver pygmaeum* crowded among loose rocks where their tiny orange flowers and gray foliage appeared elfin in their surroundings.

Descending from the alpine regions and searching in the lower sections, we found on steep rock slopes large colonies of the pink-flowered *Penstemon Lyallii* and the fragrant yellow *Aquilegia flavescens,* and on gravelly slopes the two phacelias, *Phacelia sericea* with a thyrsoid inflorescence of bright purple flowers, and *P. Lyallii* with a corymbose light purple inflorescence. Further down in the evergreen forest region were great clumps of *Sorbus sitchensis,* shrubs averaging only 8 to 10 feet in height, every branch terminated by a large cluster of brilliant red fruits.

(To be continued)

EDWARD J. ALEXANDER.

VEGETATIVE PROPAGATION OF DAYLILIES

The crown of a daylily plant comprises numerous somewhat crowded and interwoven branches, each of which terminates in a bud. The branching system varies according to the character of the different species and clones, in some cases being compact with short and almost erect branches, in others appearing more loose with some branches developed as rhizomes. While many of the branches are weak and poorly developed, the more vigorous ones terminate in a fan of leaves from which flower scapes eventually arise. The leaves are in two ranks with their nodes close together. It appears that there is a potential bud in the axis of many, if not all, of the leaves; but as a plant grows naturally there is decided dominance of the apical bud with relatively few lateral branches becoming evident in the development of the crown of a plant.

In ordinary propagation a plant which has enlarged to suitable size is divided into two or more parts. The multiplication depends on the natural increase in the number of branches which develop to good size. By giving attention to methods of propagation the increase of plants may be speeded up decidedly.

The aim of special methods of somewhat artificial propagation of daylilies is to force development of plants from buds which would otherwise remain dormant or poorly developed. This may be accomplished in several ways: (1) by dissection of the crown and the separation of the various branches or buds, which are then used as cuttings or as single-stemmed plants of small size; (2) by slicing a stem and its apical bud vertically into sections, which may be called "section cuttings"; (3) by making transverse sections, which may be called "node cuttings," of elongated rhizomes; (4) the use of flower scapes for "scape cuttings" and the care of the proliferations which may naturally arise.

1. By the simple method of dissection each branch of the crown may be isolated as a cutting. Thus many of the weaker branches, most of which would at best have a delayed development, may be induced to make a reasonably rapid growth. In making these stem cuttings, active roots which are present or dormant ones which are fleshy with stored food may be left attached to the stem and included in the cutting, which then is really a plant of small size. Placed under conditions which induce good growth with increase in crown branching, vigorous new individuals normally result.

FIGURE 1. Two vertical section cuttings were made through a medium-sized bud and about one inch of its stem, and several fleshy roots were left attached. In a period of three months one cutting had developed as here shown. The fleshy roots had shriveled and mostly decayed; a bud (B1) had developed which assumed a vertical position in the original bud above

FIGURE 2. Proliferations naturally develop in abundance on the scapes of certain daylilies, especially some of the evergreen types, as shown at the left. These become small plants with leaves, stems, and roots, and they may be potted up and utilized for propagations, in the manner shown in the illustration directly above.

the cut surface (c. s.) of the stem; and two lower lateral and dormant buds developed as short rhizomes, and their terminal buds formed plants (B2 and B3). The other half-section produced two plants. Thus five fine young plants were obtained from the two section cuttings of one bud in a period of three months. At this stage each of these may be sectioned for further propagation. If each half-section gives only two new buds every three months the rate of increase is 1: 4: 16: 64: 256. To start with 5 buds, at a similar rate of propagation more than 1,000 small plants may be obtained in a period of 12 months. While this rate of increase is not possible for all daylilies, it is certain that by special care and rather constant attention the special means of vegetative propagation will greatly speed up the numerical multiplication of a clone.

The small plants such as are here shown may be allowed to enlarge naturally and with reasonable care should be large enough for sale and garden planting in from two to three years.

Certain modifications of this method may be employed in nursery practice. (a) The entire plant may be dug and dissected and all the stem cuttings placed in flats or in a cutting bench. (b) The larger buds with a portion of the stem may be taken while a plant is left standing in the soil. This procedure often induces formation of buds on decapitated stems. Later this process may be repeated on the same plant.

2. The making of vertical section cuttings increases the number of cuttings which may be obtained from a plant. Our experience is that many of the buds, especially those with a good fan of leaves, may be sectioned vertically into two parts, each of which may give rise to from one to three fine plants and sometimes more. Roots may be included on some or all of the section cuttings. The writer has usually not made more than four vertical sections from a single stem and its terminal bud except when the bud had been large; then as many as twenty sections have been made. Varieties and species differ in the response to cuttings. One clone tested seems to give no more than one bud to a half-section cutting and some of such cuttings merely rot. Others, however, reproduce rapidly, as explained under FIGURE 1.

3. The elongated rhizomes common for various daylilies consist of a vigorous terminal bud and numerous somewhat elongated internodes with the leaves reduced to rudimentary scales. When the terminal bud reaches into the air it forms a fan of green leaves and a cluster of roots soon develop to form a small-sized plant. Relatively few roots have developed along the rhizome and its lateral buds are either dormant or undeveloped. Attempts have been made to use the entire length of the rhizome as node-cuttings by making transverse sections diagonally across the nodes so that each piece contains at least one axis of a leaf. The terminal bud may be used either as a stem-cutting or as a section-cutting. The results obtained from node cuttings have not been very promising or consistent. Possibly the stage of development and the condition of the rhizome are factors to be considered.

In employing any of the methods described above (1, 2, and 3) it may be noted that various daylilies are entirely dormant during winter and that the propagation of these should be started early in spring. For the so-called evergreen daylilies, which grow vigorously all winter in a greenhouse, propagation may be rather continuous throughout the twelve months.

4. Certain daylilies, and especially some of the evergreen types, regularly produce proliferations in the axils of the bracts at nodes on the flower scapes. One, two, or even more buds may develop at one node. Each becomes a short branch at the base of which roots begin to form. These may be removed and placed in soil or a section of the scape including the node and its branches may be utilized as a cutting. The natural formation of these proliferations suggests that special methods of forcing similar buds on cuttings of scapes may be possible for various of the daylilies.

Cuttings have been placed in mixtures of half sand and half potting soil, and also in soil mixtures to which granulated peat was added. They have been grown in pots placed in coldframes during summer or in a greenhouse during winter and they have been placed in flats and in a cutting bench. Satisfactory results have been obtained in all cases provided there was partial shade and abundant moisture.

It seems that adventitious buds seldom if ever appear on the stems of daylilies and thus far all efforts to obtain buds on roots have failed. A single root, however, and especially a fleshy root, plus a sector or segment of the stem to which it is attached, may be used with some success in propagation, but in such a case the bud may have been more or less preformed.

It would seem that the use of growth-promoting substances (as plant hormones and various chemicals) may be of value in forcing rapid growth of roots and buds in the cuttings of daylilies. This treatment has, however, thus far failed to stimulate the formation of buds on roots, hence it seems that for successful propagation of daylilies a portion of a stem should be included in the cuttings which are made.

The studies reported above have been in progress for several years, but so many aspects of the experiments invite further study that the writer has hesitated to make public the results. A recent paper*, however, describes a method of "crown cuttage" and reports that this is now being tested in Florida. The results which have been obtained at The New York Botanical Garden indicate that the special methods of propagation noted above are of definite value for increasing the rate of propagation in daylilies.

A. B. Stout.

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* Propagation of *Hemerocallis* (Daylilies) by Crown Cuttage, by Hamilton P. Traub, in Herbertia 3: 123 (1936).

EVERY GARDEN MEMBER TO RECEIVE ADDISONIA

Each member of The New York Botanical Garden, beginning this year, will receive a subscription to *Addisonia,* as well as to the JOURNAL.

Since its establishment in 1916, through a bequest of the late Addison Brown, a prominent figure among the early patrons of the Garden, *Addisonia* has been the leading American publication in the presentation of plants of horticultural interest. Two numbers are issued annually, each containing eight full-page illustrations in color, accompanied by a popular and a botanical description. Every subject illustrated is either a native American plant or is an exotic which has been raised at The New York Botanical Garden, and the descriptions are written by botanists who are best acquainted with the plants in question. Since 1929 it has been produced under the editorship of Edward J. Alexander.

Long known for the high quality of its reproductions, *Addisonia* has previously gone only to a select list of subscribers whose prime interest is in decorative plants. The cost of one volume, consisting of four numbers published over a period of two years, is ten dollars. Now, through special action recently taken by the Board of Managers of the Garden, this unusual publication will be made available to every individual member of The New York Botanical Garden.

STAFF MEMBERS SPEAK AT ATLANTIC CITY

Representing The New York Botanical Garden with addresses at the 1936 meeting of the American Association for the Advancement of Science, The Botanical Society of America, and allied organizations, in Atlantic City December 28-31, were six members of the staff of The New York Botanical Garden. Dr. H. A. Gleason, who has been Vice-president of the Botanical Society of America during the past year, presented a paper on "Generic Lines in the Melastomaceae;" Dr. F. J. Seaver gave an illustrated report on his work as editor of *Mycologia;* Dr. A. B. Stout was scheduled for two papers: "Breeding for Seedlessness in Grapes" and "The Inheritance of Incompatibilities in the Petunia Rosy Morn." He also arranged an exhibit staged by the Genetic Society of America showing the ancestry in the production of the mahogany-red or purplish type of daylily, exemplified by Theron.

Two scientists who have been doing laboratory research at the Botanical Garden also gave papers, F. A. Varrelman on "The Fluorescence Microscope and Its Use in Plant and Animal Anatomy" and W. M. Porterfield on "The Degeneration of Free Chromatin Elements." A short discourse on "*Asclepias tuberosa* and *A. decumbens*" was scheduled for Dr. W. H. Camp, who is now in Mexico.

Dr. B. O. Dodge spoke on "Spindle Orientation and Spore Formation in *Gelasinospora tetrasperma,*" while two special students working under his direction, Bernice Seaver and Iris Campbell, presented further data on monosporous cultures in *Neurospora tetrasperma* and in *Gelasinospora tetrasperma,* respectively. E. J. Alexander reported on two interesting plants found on the Rocky Mountain expedition last summer: *Kelseya uniflora* and *Penstemon acaulis.*

WITH OUR COLLABORATORS

Judging by the communications which have come to us, the current field season has been a busy one for our collaborators, despite the general drought which has been plaguing the North American continent for more than ten years. Though it was hoped that the spell was broken, the dryness seems to have been more severe than ever in certain sections. Dr. Delzie Demaree, who began his season's collecting in Oklahoma and later transferred it to Arkansas, reported drought troubles all season. Dr. F. J. Hermann, who spent much of the collecting season in northern Michigan, reported having procured an extensive set of specimens. In a recent letter he says that: "Early in August even the bogs had dried out and sphagnum had given place to baked peat fissured by great crevices." If such conditions continue for a similar period of years we may expect to witness a marked change in the distributions of certain species.

Those who must fold up their collecting outfits for the winter may envy Prof. Henri Stehlé, for he is not particularly bothered by seasonal changes. During the past year Professor Stehlé has been engaged in the continuance of his study of the flora of Guadeloupe. His various shipments of specimens have greatly enlarged our knowledge of this region.

W. H. Camp.

LEWIS RUTHERFURD MORRIS

Dr. Lewis Rutherfurd Morris of New York City, a member of the Board of Managers of The New York Botanical Garden, died December 9 at the age of 75. Born in 1862, he received the degree of Doctor of Medicine from Bellevue Medical College, New York, in 1884. He became a member of the Corporation of the Botanical Garden in 1914, and the same year was elected to the Board of Managers to fill the vacancy caused by the death of John Innes Kane. He was also a member of the Board of Trustees of the New York Zoological Society.

At the annual meeting of the Botanical Garden, January 11, a memorial resolution honoring Dr. Morris was adopted by the Board of Managers.

WILLIAM HENRY CARPENTER

Dr. William Henry Carpenter, a member of the Corporation of The New York Botanical Garden since 1917, died at Jerry Run, near Downington, Pa., November 25. He was 83 years old. Although never actually a member of the Scientific Directors of the Garden, he served on that Board from 1914 to 1925 as the personal representative of Dr. Nicholas Murray Butler, President of Columbia University.

Dr. Carpenter received the degree of Ph.D. from Freiburg in Baden in 1881, and was a member of the Columbia faculty from 1883, first as instructor in Germanic and Scandinavian languages, eventually as head of the department, then through other advancements to the position of Provost in 1912, in which, while continuing his work in languages, he handled a large amount of University business. He was made Provost Emeritus in 1926.

NOTES, NEWS, AND COMMENT

Within a few days of his death, Dr. Marshall A. Howe was elected President of the Botanical Society of America. His place will be filled during 1937 by Dr. Edmund W. Sinnott, a member of the Board of Managers of The New York Botanical Garden.

* * *

The first conference of the autumn of the Scientific Staff and Registered Students of the Garden was held on November 25, at which time Mr. T. H. Everett reported on "Seed Collecting in

the Rocky Mountains." Lantern slides were used to portray various regions visited, habitats where species were found, and typical plants of many species whose seeds were collected.

The conference for December was held on December 9 with the following program: "Social Organization in Certain Fungi" by Dr. B. O. Dodge, and "The Navel Type of Fruit in Apples" by Prof. F. A. Varrelman.

* * *

Dr. A. B. Stout spoke before The New England Botany Club in Boston December 4 on the subject "Autumn Coloration."

* * *

Dr. B. O. Dodge addressed the Society of Biology and Medicine at Brooklyn College November 25 on "Genetics of the Fungi."

* * *

Dr. Caroline Rumboldt of the Forest Products Laboratory of the Department of Agriculture at Madison, Wisc., stopped at the Garden December 21. She is investigating the blue stain of timber.

* * *

The following visiting botanists were registered in the library during the autumn: Prof. George P. Burns, Burlington, Vt.; Dr. E. D. Merrill, Jamaica Plain, Mass.; Dr. Lily M. Perry, Cambridge, Mass.; Dr. E. J. Schreiner, New Haven, Conn.; Messrs. R. T. Clausen and M. C. Richards, Ithaca, N. Y.; Dr. Clement G. Bowers, Maine, N. Y.; Mr. F. B. Lincoln, College Park, Md.; Dr. Edgar T. Wherry and Dr. Conway Zirkle, Philadelphia, Pa.; Mr. Edwin B. Bartram, Bushkill, Pa.; Mr. H. Harold Hume, Gainesville, Fla.; Mr. William A. Knight, St. Augustine, Fla.; Mr. Robert P. St. John, Floral City, Fla.; Mr. Robert M. Senior, Cincinnati, Ohio; Dr. Edgar Anderson, St. Louis, Mo.; Mr. Leo A. Hanna, Moscow, Idaho; Dr. Paul B. Sears, Norman, Okla.; Mr. Frederick Leissler, Jr., Seattle, Wash.; Mr. Reed C. Rollins, Pullman, Wash.; Dr. Frans Verdoorn, Leyden, Holland; Dr. Erzébet Kol, Szeged, Hungary; Mr. Frederick Dickason, Rangoon, Burma; Prof. Kichii Miyake, Tokyo, Japan; Mr. J. Gordon Gibbs, Plant Research Station, New Zealand; and Miss Eileen E. Fisher, Melbourne, Australia.

REVIEWS OF RECENT BOOKS

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

Garden Plants from South Africa

The appearance of an American book devoted entirely to South African plants* serves to emphasize the fact that gardeners in this country have not availed themselves of the flora of that region to nearly the extent that English gardeners have. Yet our diversified climate and our superior conditions of light at once suggest that the United States is better suited to the widespread culture of the South African flora than the British Isles.

Unlike many of our modern horticultural writers, Mrs. Coombs has not attempted to base her book upon a smattering of hastily acquired knowledge. Instead, she has spent a number of years studying the plants of which she writes, and, not satisfied with research work in libraries and among living collections in this country, she extended her knowledge with studies at Kew, then spent some months in South Africa, where she visited many notable gardens, in addition to observing and collecting plants from the wild.

"South African Plants for American Gardens" is admittedly horticultural in its purpose. In the interests of accuracy, descriptions have been adapted from recognized botanical authorities. These at first may appear somewhat technical, but the glossary at the back easily clarifies the meanings of unfamiliar words.

This new book brings into one volume for the first time a fund of information for the American gardener, and should inspire many to venture into the culture of South African plants. A valuable portion of the work is the list of dealers who can supply the plants which are described.

Mrs. Coombs gives general directions for the cultivation of each group and genus of plants, and sometimes for individual species, but she wisely refrains from giving too many details, since cultural requirements in any particular locality would obviously not be applicable in all other parts of the country. Any gardener with reasonable experience in growing plants should be able to interpret her suggestions to suit his own climate.

Perhaps it was her great enthusiasm for the plants of South Africa which led the author to suggest that the succulents of that

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* Coombs, Sarah V. South African plants for American gardens. 364 pages, illustrated with photographs in half-tone and in color; indexed. Frederick A. Stokes Company, New York, 1936. $4.50.

region "may be put in rock gardens in summer but must of course be taken up in the autumn, since they are not hardy in the northern states." The rock-garden purist will hardly reconcile himself to the bedding-out of pot-grown succulents for a few short weeks of the year.

I am glad to see interest turned in the direction of South African plants. A book such as this gives the gardener a conception of the geographic origins of plants, and leads the way toward the enrichment of our gardens.

T. H. Everett.

More on Rock Gardening

Since Lewis B. Meredith's book on rock gardening* is written primarily for the British Isles, allowances will have to be made by the American reader for the climatic differences between the two countries. Nevertheless, the cultural practices (which have been serving British gardeners since the book was first published by Williams & Northgate in 1910) are so fundamentally sound that the book makes a distinct addition to the rock garden section of any library.

Emphasis is placed on preparation of the soil and provision for drainage—important features which are too often neglected. The suggestions on planting are excellent, and should help to make the rock garden a genuine beauty-spot if they are carried into practice.

Interesting to read is a chapter on cost of construction, though labor and material prices vary so widely in the two countries that where prices are mentioned the practical value may be limited, especially since money is figured in British units.

The book's greatest fault, perhaps, is a certain carelessness in production which has allowed many typographical errors, especially in the spelling of plant names, to occur.

While we definitely do not recommend quarried rock for construction of rock gardens, the author's ideas and word pictures are bound to be of great help to the beginner.

A. C. Pfander.

On Fruits and Berries

A chatty book, the small volume on fruits and berries written by Governor Aiken of Vermont† belongs in the category of garden books which serve largely to entertain.

True, directions are given for raising a number of fruits, but I

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* Meredith, Lewis B. Rock gardens, how to make and maintain them. 390 pages, illustrated with photographs; indexed. Third edition, Greenberg, New York, 1936. $3.

† Aiken, George D. Pioneering with fruits and berries. 94 pages, illustrated with photographs; indexed. Stephen Daye Press, Brattleboro, Vt., 1936. $2.

feel they are apt to leave the inexperienced grower a little puzzled. At the same time, except for one or two chapters on berries, the cultural instructions are too indefinite to be of much use to the commercial grower. Selections of varieties of fruits to plant are avoided, hence the descriptions of the many varieties available are as confusing as nursery catalogs. The subject of where to plant is carefully treated in several chapters, yet this seldom enters into the problem of the home grower, as his choice is generally limited.

The statement on the last page: "As this book deals with the first two years of fruit growing only . . . " might well have been conveyed in the title so that the purport of the book would have been understood at a glance. To my mind, the least eventful part of a fruit-tree's history—except for pruning when planting, and forming the main branches of the head—occur during the first two years.

EDWIN BECKETT.

THE AMERICAN DAFFODIL YEAR BOOK

A second annual year book* has been prepared by the Narcissus and Tulip Committee of the American Horticultural Society. We understand the committee was formed as far back as 1933, but did not have enough material to publish until 1935, when daffodil lovers throughout the nation proclaimed the first issue as a real step toward recognizing the value of this gem among garden flowers.

The 1936 issue maintains the high standard of its predecessor. There is much that is helpful in cultural detail and in this direction valuable hints may be gleaned from several of the articles. Writers from districts so wide apart as California, Texas, and New Hampshire relate in easy style their experiences with many of the finer varieties from the various types.

A review of who's who in the development of the daffodil as we know it today is handled in most interesting fashion by Violet Niles Walker. She tells us how Dean Herbert of Amaryllidaceae fame paved the way for such well-known hybridists as Barr, Engleheart and Williams.

The 16 full-page illustrations are up to the usual high standard found in the National Horticultural Magazine, and while the varieties chosen are not all the very latest and most expensive, yet, all are daffodils that even the fastidious cannot afford to discard.

No daffodil enthusiast should miss this publication.

J. G. ESSON.

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* Morrison, B. Y., editor. American Daffodil Year Book. 76 pages, illustrated with photographs. American Horticultural Society, Washington, D. C. 1936. 50 cents.

THE NEW YORK BOTANICAL GARDEN

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Established as a privately endowed institution, aided partially by City appropriations, The New York Botanical Garden is dependent for its progress largely upon benefactions and memberships. Through these means, though young as botanical gardens go, it has become the third largest institution of its kind, its library, herbarium, and horticultural collections ranking among the finest and most complete in any country.

Membership in The New York Botanical Garden, therefore, means promotion of scientific research in botany and the advancement of horticultural interests. Scientifically, the Garden is able to serve as a clearing-house of information for students and botanists all over the world; horticulturally, it often serves as a link between the plant explorer or breeder and the gardening public.

Through memberships and benefactions, provision is made at the Botanical Garden for the training of young scientists and student gardeners; hundreds of new books are added annually to the library, which is open daily to the public for research and reading; free exhibits are maintained in the museum, the greenhouses, and gardens, and lectures, courses, and free information in botany and gardening are given to the public.

Each individual member of the Garden receives:

(1) A copy of the Journal every month.

(2) A copy of Addisonia twice a year, each number illustrated with eight colored plates of unusual plants, accompanied by complete descriptions and other pertinent information.

(3) A share of surplus plant material of interesting or new varieties whenever it is distributed.

(4) Announcements of special floral displays at the Garden from season to season.

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A limited number of garden clubs are accepted as affiliates. The privileges of affiliation are a subscription to the Journal, announcements of displays, a specially conducted tour of the grounds and greenhouses, and a lecture once a year by a selected member of the staff.

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I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ————————.

Conditional bequests may be made with income payable to donor or any designated beneficiary during his or her lifetime.

All requests for further information should be addressed to The New York Botanical Garden, Bronx Park, New York, N. Y.

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Pelargonium echinatum, now in bloom in Range 1.

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CAROL H. WOODWARD, Editor

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SCIENTIFIC RESEARCH

Without the scientific research of the past half-century, the world in which we live today would be far different. Besides the obvious advances made in chemistry, physics, and engineering, research in biology has given us new points of view on the living things of the earth, how they grow, how they are reproduced and what things influence their inheritance; what causes mutations in their form, color, or composition; how they are nourished and how they often support or destroy each other.

Discoveries in the behavior of plants have opened new fields of knowledge affecting the whole genetic scheme of everything that lives. Scientific researches at The New York Botanical Garden are unearthing the reasons for heretofore unexplained factors in heredity. Through an intensified study of sterility and fertility, problems of breeding among flowering plants are being clarified, and, incidentally, splendid new types of garden flowers are being developed, exhibiting distinctive colors and forms and even new odors. In addition, through scientifically controlled hybridization, carried out by staff scientists coöperating with other institutions, new hardy seedless grapes are being produced and fast-growing poplar trees to aid in reforestation are being bred.

In the field of plant pathology, pure scientific studies are affecting the fields of agriculture, horticulture, and medicine, as well as botany, through the revelation of the type of hybridization that is capable of taking place among the fungi.

Equally significant—though in the light of the future, no more important—is the steady work being done, winter and summer, on the control of plant diseases.

The identification of plants discovered in every part of the world is another scientific endeavor to which the staff is contributing. Thus is the whole world's knowledge of botany constantly being extended, and with this knowledge, problems affecting human life in many of its phases are being steadily clarified and solved.

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MARSHALL AVERY HOWE

Doctor Marshall Avery Howe, Director of The New York Botanical Garden, died at his home in Pleasantville, New York, on December 24, 1936, shortly after midnight. He had suffered a severe illness in the previous May but recovered sufficiently to resume duties at the Garden during the late summer and the autumn. Then his strength failed and a period of illness terminated in death. Almost the entire staff of The New York Botanical Garden, many other of Dr. Howe's associates in scientific work, numerous friends, and members of the family gathered at the Presbyterian Church in Pleasantville on the day following Christmas for a service to his memory.

Two children, Gertrude Dexter Howe and Prentiss Mellen Howe, survive Dr. Howe. His wife, the former Edith Morton Packard, died in 1928. Four brothers are still living:—Dr. Clifton Durant Howe, Dean of the School of Forestry, University of Toronto; Carlton Dexter Howe, Principal of the C. T. Plunkett Junior High School, Adams, Massachusetts; and Arthur Otis and Hermon Alline Howe, both of Newfane, Vermont.

The family name Howe arose in the medieval forms, At How and A-Sax Hou, meaning a hill or a mountain. In England the names Hoo, Hooe, How and Howe were numerous from early date and many with these names have been prominent in English history. Dr. Howe was of the eighth generation in direct descent from John How, who came from England and settled in Sudbury, Massachusetts, in 1638 or 1639. His descendants became numerous in New England and many of them were prominent, especially in early colonial time. About 1701 a grandson of John How built the Howe Tavern or Red Horse Tavern, which was later known as the Wayside Inn of Sudbury. Dr. Howe's mother, Gertrude Isabel Dexter, was also of a well-known New England family of English origin.

Dr. Howe was born on June 6, 1867, in Newfane, Vermont, and it was there among his beloved Vermont hills and vales that he spent his boyhood and young manhood. He attended public schools and was graduated from the University of Vermont in 1890 with special scholastic honors. For a short period he was a teacher in the Brattleboro High School but soon his interests and studies in botany led to his acceptance of an instructorship at the University of California. Shortly after he reached California evidence of an early interest in seaweeds appeared in what is apparently his first scientific paper,[1] in which are reported observations on the methods of reproduction of three species of marine algae. Dr. Howe remained in California five years and then continued botanical studies at Columbia University, from which he received the degree of Doctor of Philosophy in 1898. In 1919 the University of Vermont bestowed on him the honorary degree of Doctor of Science.

For the years 1899-1901 Dr. Howe was a member of the Department of Botany and curator of the Columbia University herbarium. During this period he was active in studies of marine algae for which he made explorations in Bermuda and at points along the Atlantic coast of the United States.

Dr. Howe's years at Columbia coincided with the earliest years in the development of The New York Botanical Garden. The site for this institution was approved by the Park Commission of New York City in July 1895 and the appointment of Doctor Nathaniel Lord Britton as the first director-in-chief came on July 1, 1896. The Museum Building was turned over to the Garden authorities for use in April, 1900. In Dr. Britton's report for 1900[2] there is the following statement regarding investigations which were done, at least in part, by Dr. Howe at the newly established Botanical Garden. "Dr. M. A. Howe, of Columbia University has been occupied with researches upon the Hepaticae, having brought out in Memoirs of the Torrey Botanical Club a fine volume on the California plants of this group; more recently he has devoted himself to the critical study of algae." In this same number of the Bulletin of The New York Botanical Garden there was a publication by Dr. Howe on "An Enumeration of the Hepaticae collected by R. S. Williams, 1898-1899." This reported

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[1] Miscellaneous Notes. Pittonia **2**: 291. 1892.
[2] Report of the Secretary and Director-in-Chief. Bulletin of The New York Botanical Garden **2**: 1-24. 1901.

MARSHALL AVERY HOWE
1867—1936

on the determination of twenty-four known species and one new species. At the time when Dr. Howe joined the staff of The New York Botanical Garden in 1901 he had published 25 papers. For the newly established Botanical Garden this year was "one of great activity in construction, installation of exhibits, exploration, investigation, and teaching." [3] Dr. Howe and Dr. Arthur Hollick were added to the scientific staff during the early summer. Evidently Dr. Howe's appointment was made to provide full facilities for his study of the Hepaticae and Algae and naturally his work was immediately directed to the collection and further

[3] Quotation from annual report of the Director in Bulletin of The New York Botanical Garden **2**: 235-267.

critical study of these plants. From June 21 to September 9 of that year Dr. Howe was in Nova Scotia and Newfoundland chiefly for the collecting of marine algae, and his report of this expedition states that about 4,000 dried herbarium specimens were collected and that for many species material was preserved in formalin for special study.

Dr. Howe was advanced to a curatorship in 1906. In 1923 he was appointed Assistant Director and on October 1, 1935, he became Director of The New York Botanical Garden and also Professor of Botany in Columbia University. Under his curatorship the collections of liverworts and algae grew rapidly until they comprised 78,229 specimens of Algae and 59,420 specimens of Hepaticae. Many of these were collected by Dr. Howe in Newfoundland, Nova Scotia, Bermuda, various islands of the West Indies, Florida, and Panama. There is a comprehensive collection of calcareous algae supplemented by several thousand microtome sections. There are thousands of slides, filed with herbarium material, which were prepared for the microscopic examinations involved in making critical determinations and in naming new species. Dr. Howe was active in the exchange of specimens and as a result there are many collections from continents other than North America. The herbarium is in extremely good condition and it is arranged in accord with the Engler and Prantl system.

Dr. Howe witnessed the growth of The New York Botanical Garden from a mere beginning into one of the leading botanical gardens of the world. Through his personal efforts, scientific research, editorship of various publications, years of assistance to the director, many contacts with the public and finally as the director, Dr. Howe contributed greatly to the development of the institution. In the biographical account which Dr. Howe wrote in memory of Dr. Britton,[4] there are comments on important phases in the development and progress of The New York Botanical Garden during the thirty-three years of Dr. Britton's directorship. This tribute to Dr. Britton reveals an intimate relationship between the two men in the work of the institution which they both served so well.

Even in later years when editorial and executive duties occupied a large portion of his time, Dr. Howe was steadfast in con-

[4] Nathaniel Lord Britton, by Dr. Marshall A. Howe, in the Journal of The New York Botanical Garden 35: 159-180. August 1934.

tinuing scientific work, which centered in the identification, the classification, and the study of the life histories and activities ot the liverworts and the marine algae of North America, and in this field he became an eminent authority. An outstanding contribution by Dr. Howe to botanical and geological science pertains to the role of lime-secreting algae in the formation of limestone reefs in oceanic waters, which is a phenomenon previously attributed solely to coral animals. His interest in this matter developed early and the first of his publications on coralline algae appeared in 1904 and 1905. His studies in this field involved the explorations already noted and also the microscopic examination of many specimens of limestone deposits now elevated above sea level. Special studies were also made by Dr. Howe on the precipitation of lime by fresh water algae in streams, lakes, and hot springs. The contents of the various technical papers which he published on these matters and of the studies which others have made were recently summarized by him in a popular radio broadcast which was afterward published.[5]

In recognition of his scientific contributions, Dr. Howe was elected to membership in the National Academy of Sciences in 1923. He was a Fellow in the New York Academy of Sciences, which he served as president in 1934 and 1935, and he was a Fellow in the American Association for the Advancement of Science. He was president of the Torrey Botanical Club for the year 1936. During the last few weeks of 1936 he was elected by membership ballots to the presidency of The Botanical Society of America for the year 1937, and he will be recorded in the annals of this society as the president-elect for the year 1937. From 1924 until his death Dr. Howe was editor of the *Journal of The New York Botanical Garden*. He was for a time editor of *Torreya* and of the *Bulletin of the Torrey Botanical Club*.

A wide circle of gardeners and horticulturists will remember Dr. Howe for his more popular studies of the garden dahlias. Through his efforts a splendid collection of these plants has, for nineteen years, been grown for public display at The New York Botanical Garden. His reports on these plants, his evaluations of the varieties, and his popular lectures on the dahlias have been

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[5] Plants that form reefs and islands. The Scientific Monthly 36: 549-552. June 1933. A radio talk presented January 27, 1933, under the auspices of Science Service.

of value to gardeners, and in recognition of this service he was recently awarded a gold medal by the American Dahlia Society. For several years Dr. Howe was a vice-president of the Federated Garden Clubs of New York, to whose activities he contributed valuable advice and aid. He was also a member of the Board of Directors of the Horticultural Society of New York.

In his home garden Dr. Howe grew choice varieties of dahlias, irises, tulips, peonies, and roses. Many hours of summer evenings and holidays were spent in this garden and the care of the plants was mostly from his hands. He derived much pleasure and joy from the excellence of his plants and their flowers.

The extent and worth of Dr. Howe's services to his home community are well known. For 22 years he lived in Pleasantville, N. Y., a suburban village of about 5,000 inhabitants. He was active in the best interests of the University Club of Pleasantville, of which he was for a time president. He was an active member of the Garden Club of Pleasantville and he served several terms as its president. Since 1927, he had been first the secretary and then the president of the Board of Trustees of the Pleasantville Free Library, a post from which he recently resigned with reluctance because of ill health. In many matters pertaining to education, local politics, and civic welfare, his influence was potent and wholesome. In all these affairs his standards of duty and his principles were high.

Those who have heard an address of any sort by Dr. Howe will remember that it was scholarly, perfect in diction, adequate for the subject at hand, well prepared, well delivered, and flavored with true humor when this was timely.

Dr. Howe was a man of simple tastes, placid temperament, cheerful disposition, penetrating humor, calm judicial mind, and steadfast purpose in the dictates of his conscience in matters of duty and personal conduct. His scientific work is characterized by accuracy, thoroughness and originality. To his colleagues, coworkers, and subordinates he was always kindly, helpful, and fair and considerate in all relations.

There are many persons who will cherish through life the memory of this man who was a good neighbor, a true friend, and a helpful and loyal associate. His influence as a useful citizen will live long in his home community. Dr. Howe's attainments in botanical research will live in the priceless heritage called science

to which he devoted much of his life and which is bequeathed and dedicated to all mankind.

A. B. Stout.

IN MEMORIAM, MARSHALL A. HOWE*

Marshall Avery Howe, who died at his home in Pleasantville, New York, in the early hours of the 24th of December, 1936, in his seventieth year, had been Director of The New York Botanical Garden for less than fifteen months. His importance in the history of the institution, however, is to be measured by more than thirty-five years of faithful service as assistant curator, curator, assistant director, acting director, and director.

A native of Vermont and a graduate of the University of that State, he had spent five years at the University of California and five more at Columbia University, and was already a Doctor of Philosophy, before his appointment as a member of the Garden staff in the summer of 1901. At that time he had become widely known as a student of hepatics and marine algae, and it was to these groups of plants that he devoted all time available for research during the remainder of his life. Administrative duties, however, seriously restricted the opportunity for such study in later years.

The collection of living dahlias that has contributed so much to the popularity of the Garden since 1918 was due entirely to his initiative, and a portion of his time, year after year, was devoted to its maintenance and development. His horticultural interests also extended to other groups of ornamentals.

Conscientiousness, circumspection, and thoroughness characterized all of his work. Affable in his attitude toward every one, he had few intimates, and he chose these deliberately. Rare is the man whose emotions are kept so thoroughly in subjection to his intellect as were his. His caution stood him in good stead as an administrator, and rarely if ever could any event ruffle his equanimity.

The Board of Managers of The New York Botanical Garden hereby expresses its sense of sorrow and loss in the death of Marshall Avery Howe, and extends to his family deep sympathy in their bereavement.

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* This is the resolution adopted by the Board of Managers of The New York Botanical Garden at its annual meeting January 11.

REPORT OF THE ROCKY MOUNTAIN EXPEDITION
II

Leaving Glacier Park behind, we turned southward again, stopping over a day a few miles north of Helena, Montana, to visit the river gorge known as the Gates of the Mountains. The Missouri River here cuts its way through a series of sheer cliffs of white limestone 1,000 to 1,200 feet high. Herbarium records had told us that here was the type locality for *Kelseya uniflora,* a very dwarf, cushion-forming shrub related to the spiraeas. Upon asking permission of the lessee of the land to collect plant seeds, he at once asked if we had seen the "Kelseyi moss", and then told us that as a boy he had been Kelsey's companion when the plant was discovered. We were told the exact cliff-top upon which it had first been seen, and after two or three hours' work gaining that place, we found that the plant still grew there as well as on all the adjacent cliffs of this gorge, though only on the river-facing sides. The plant forms dark-green cushions several inches thick undulating over irregularities of the rock surface like a cushion-moss, and would easily be mistaken for such were it not for the seed capsules, which closely resemble those of *Spiraea.* Not one plant did we find rooted in soil—each and every plant sent its hard woody root straight down into cracks in the rock. The seed was not yet ripe, but it was obtained on a second visit a month later.

Going back to Yellowstone Park, we looked over the more likely portions of that area, finding at that time only four plants suitable for our purpose—*Penstemon fruticosus* on gravelly slopes, and among tumbled boulders of travertine, *P. deustus,* a white-flowered species unique for its holly-like leaves. Above timberline on Mount Washburn we found seed of *Phlox caespitosa* and *Polemonium confertum.* Returning to Teton Park, we ascended the range to the glacier on the Grand Teton, near which we collected seed of *Salix cascadensis,* the world's smallest willow.

The Teton Mountains are one of the most spectacular mountain ranges it is possible to conceive. From the floor of Jackson Hole at 6,000 to 7,000 feet elevation, they rise nearly 7,000 feet more into the air, a long narrow ridge of lightning-jagged peaks of white granite, shining like polished silver after a rain and in the rosy glow of sunset appearing unearthly as though a celestial afterthought of Creation.

FIGURE 1. The great cliffs at the Gates of the Mountains—habitat of *Kelseya uniflora.*

In order to allow the plants we had seen in flower during the last two weeks to ripen their seed, we decided to explore the Colorado Mountains more completely, as they were the only section unaffected by the summer drought. Going again to Rocky Mountain National Park, we explored across the main divide, collecting seed of *Rydbergia grandiflora,* a dwarf composite with golden flower-heads 2 to 3 inches in diameter. Across the divide, near Grand Lake, we picked seed of *Oxytropis splendens.* Going a bit further west to the town of Kremmling, we followed a very poor mountain road through Gore Canyon down to the village of State Bridge. Here we found *Penstemon pachyphyllus,* an interesting plant with thick blue-green leaves.

Continuing southward to Leadville, we turned off the road at Twin Lakes to have a look at Independence Pass. In the lower valleys here, we found field after field of *Gentiana Parryi* and *G. affinis,* both first-rate plants with rich blue flowers. Finally on the very top of the pass at nearly 12,000 feet, we located by far the largest quantity of *Saxifraga flagellaris* yet seen and we ob-

tained seed. But our real thrill awaited us. Long had we sought the rare perennial fringed gentian, *Gentiana barbellata,* but always without success. In descending the pass an unusual shade of blue caught our eye, and we stopped for a look . . . *Gentiana barbellata* at last, a glorious grayish-azure with spicy scented flowers . . . truly a prize. Too early for seed, we took careful notes so as to obtain it later—a pleasure, alas, never to be realized.

A long run down the semi-desert valley of the Colorado River to Grand Junction completed, we turned southward again, seeking the town of Ouray. We found it at last, buried in a tiny valley completely encircled by 10,000- to 11,000-foot peaks. Finding nothing new here, we went across Red Mountain Pass to Silverton and on to Durango, collecting seed of *Aquilegia coerulea* en route. Approaching Durango, on dry gravelly hillsides we found large colonies of *Penstemon coloradense,* a neat-growing gray-leaved species of great garden promise. A rapid run was here made

FIGURE 2. A plant of *Kelseya uniflora* four feet in diameter, at the Gates of the Mountains near Helena, Montana.

toward the east, stopping in Wolf Creek Pass to collect seed of *Aconitum columbianum* and *Polemonium Archibaldae,* and in La Veta Pass for seed of *P. foliosissimum.* The two polemoniums

FIGURE 3. The Grand Teton rears its head above the alpine slopes around Surprise Lake. On the slopes grows *Salix cascadensis* and on the lake margin in the extreme foreground, *Gaultheria humifusa, Kalmia microphylla* and *Phyllodoce empetriformis* and *P. glanduliflora.*

here mentioned should be excellent garden plants, as both form dense clumps with many stems topped by great clusters of bloom, *P. Archibaldae* rich purple, *P. foliosissimum* light purple.

Once more on the stony hills and plains of southeastern Colorado, we sought out *Melampodium cinereum* and *Zinnia grandiflora,* two much-desired dwarf composites, the former making a rounded clump 6 to 8 inches high, covered with white-rayed golden-centered heads of bloom, the latter a flat-topped plant 3 to 4 inches tall, smothered with brilliant yellow-rayed heads with brick-red centers. Both were found to be plentiful in certain localities, as were also three other worth-while composites, *Sideranthus spinulosus,* a foot-high mound of gold, *Machaeranthera tanacetifolia,* an annual with fine-cut foliage and large blue-rayed heads, and the coreopsis-like *Thelesperma tenue.* Seeds of several penstemons were obtained in this hill and plain section, the most notable being *Penstemon auriberbis,* a cespitose plant with very narrow gray-green leaves and flower-spikes 6 to 8 inches tall.

Three days were spent collecting seed of previously seen plants on Pikes Peak, after which we traveled northward through Denver and west to Idaho Springs. In the valley here we saw *Clematis orientalis,* a yellow-flowered Asiatic species, escaped into waste places and along roadsides and river-banks so plentifully as to have choked out other weeds. We again went through Berthoud Pass where seed was collected of *Zygadenus elegans, Pedicularis groenlandica, Mimulus guttatus,* and *Vaccinium scoparium,* this last a shrub 6 to 8 inches tall, covered with dark-red berries. Near Tabernash on the sagebrush flats we found the much-desired *Penstemon cyathophorus.*

We now made a trip up to the Medicine Bow range for seed of previously noted plants. On the way up we stopped for *Pedicularis crenulata,* a beautiful plant with deeply crenate-margined leaves and 8- to 10-inch stalks topped by spikes of old-rose flowers. Crossing the range, we proceeded westward through Green River to Lyman, Wyoming. It was now early September, and that night after a heavy rain the temperature dropped to freezing for the first time. Next morning the Uinta Mountains to the south of us in Utah were white with snow, so in that direction we headed, to secure our seed of *Penstemon acaulis* before it was snowed under, then hurried northward and through Hoback Canyon, there gathering seed of *P. montanus.*

From Jackson we made a trip across Teton Pass, where seed of *Penstemon cyananthus* was unexpectedly found. Passing into Yellowstone Park, we secured seed of two plants overlooked before, *Ledum glandulosum* and *Boykinia heucheriformis,* the former an evergreen shrub 2 to 3 feet tall with elliptic leaves dark-green above and whitish beneath and terminal clusters of small white flowers; the latter similar to *B. Jamesii,* but differing in the smaller, purple flowers. The increasing cold of the nights caused us to hurry northward toward Glacier Park before that became snowed in for the winter. Receiving our first taste of a dust-storm, we arrived in Helena in the rain which followed it, and next morning awoke to see the surrounding mountains all white. Stopping at the Gates of the Mountains for seed of *Kelseya,* we also obtained seed of two handsome biennial mentzelias, *Mentzelia acuminata* with day-blooming yellow flowers three inches across, and *M. decapetala* with somewhat larger night-blooming white flowers. Then we bore steadily northward to Browning, only to find that Glacier Park was in the grip of a snowstorm and the roads were closed.

FIGURE 4. The alpine region of Pikes Peak, showing the summit cone. On the near slopes grow *Saxifraga chrysantha, S. flagellaris, Trifolium nanum, Mertensia alpina, Primula angustifolia, Geum turbinatum, Chionophila Jamesii,* and *Claytonia megarrhiza.*

After a day's wait, while the storm abated, we were finally allowed to cross Logan Pass, thus obtaining seed of *Gentiana calycosa, Parnassia fimbriata* and *Penstemon Lyallii.* Where previously great stretches of bloom had greeted us, the pass was now buried in a white silence, even the streams were frozen and all the surrounding peaks had donned their winter furs. The temperature was so low it was necessary to leave our motor running while we dug through the snow for our seed.

On the way south we detoured to the east to visit the Bighorn Mountains in a last effort to find *Aquilegia Jonesii.* In passing through the foothills of this range we saw we had indeed been informed correctly of the burning effect of the summer's drought. Peculiarly shaped mesas rose all around us composed of a strange black clay cracked in many directions as though the whole area had been parboiled, then baked in a firing furnace, so that only shriveled fragments of vegetation were left. As the road corkscrewed higher the vegetation slowly assumed a slightly fresher look, and above timberline there were occasional fresh snowbanks,

indicating that Nature was mercifully concealing under the robe of winter the effects of her summer of wrath. At about 10,000 feet elevation we left our car and, walking a few miles, came to a high exposed limestone ridge consisting of parched-looking cliffs and shattered talus slopes. Scattered over this barren area in various pockets and niches were the 2- to 3-inch plants of our long-sought *Aquilegia,* the seed-pods eaten off by some grazing animals, so that not a single seed was to be found. We descended back to the valley, on the way finding several colonies of *Petro-*

FIGURE 5. The expedition's truck on top of Logan Pass, Glacier National Park in mid-September. Mt. Oberlin is in the background.

phytum caespitosum, an attractive rock mat plant, growing exclusively on limestone boulders where the roots penetrated straight into the crevices without benefit of soil. But to the plant's glory be it attested that almost every rosette of leaves bore a spike either of flowers or well-ripened seed-pods, proving the wisdom of its choice of rock rather than soil for survival under drought conditions. We now turned toward the town of Red Lodge, in order to make the crossing of the Absaroka Range into Yellowstone Park.

Of all the towns seen, Red Lodge has the most remarkable approach. Passing through a deep mountain valley, one slowly climbs to the plateau above, and there looks across a level plain to

the distant Absaroka Mountains. There is no sign of the town which all arrows and maps have indicated, and the mileage gauge shows that the distance has been covered. A curious feeling comes over one that the town has vanished, until the road suddenly appears to end at the brink of a canyon, and straight below, strung the length of the valley is Red Lodge. The road makes a steep diagonal cut down the canyon wall, and, by a sharp hairpin reverse, enters the town.

And now into the Absarokas. The road continues on up the canyon, which opens into a deep mountain valley which one follows to its head, and then starts a spectacular upward spiral to the 11,000-foot plateau above. This plateau is different from any other in the Rockies. Great expanses of desolate alpine flats roll off in every direction, the only semblance of mountains being oddly squared-off and flat-topped mesa-like ridges, those at a distance appearing at this season without a sign of plant life above timberline. The nearby flats, however, tell a partial story of the vegetation. Large areas covered with dwarf willows and *Phyllodoce* are prominent, with still larger open sedge and grass flats, and frequent drifts of an attractive silvery-leaved lupine, various erigerons and asters, among which was *Aster Haydeni*—a much-desired plant, but seed had long been shattered. How we wished we had been able to come here earlier in the season to obtain those seeds!

For 20 or 30 miles the road winds across this plateau, which comes to an abrupt end where a rapid descent is made through a land of alpine lakes into a heavily forested river valley, through which the road bears northward straight toward the now prominent stone finger of Index Peak, behind which is Cooke City. From there the road becomes once again a normal mountain highway.

In Yellowstone Park, we stopped only long enough to collect seed of *Kentrophyta aculeata,* a prostrate, mat-forming legume spangled with small deep-lavender flowers. Returning to the Teton Mountains, we again made the ascent, obtaining seed of *Penstemon subglaber, Mahonia repens,* and *Gaultheria humifusa,* smallest of the wintergreens.

We then bade farewell to Wyoming and for fear of snow in the high peak region of Colorado, drove speedily there. Arriving at Longs Peak, we once more ascended it, and found the seed we

wanted of *Eriogonum xanthum, Androsace carinata, Tetraneuris lanigera,* and *Tonestus pygmaeus.*

But we had lagged too long in the north and summer had waned rapidly . . . the next morning six inches of snow covered the ground and still was falling so thickly as to obscure vision. We consulted the innkeeper, who said the storm would probably continue for two or three days and then a spell of Indian summer would follow, melting the snow in the valleys but leaving the peaks in the grip of winter until next June. Mournfully we thought of the glorious golden cups of *Ranunculus adoneus* whose seed would now be buried under the snow. Turning to packing, we bade the mountains goodby and gave our steed her reins. Down the vale and through the canyon of St. Vrain flet our faithful and well beloved Suzabelle, bearing us to the plains—but here too the air and earth were white and we paused not. On through fast deepening snow and night we sped further south to Colorado Springs, where the storm was even worse. It raged through the night, and next day we heard that shortly after we had gone

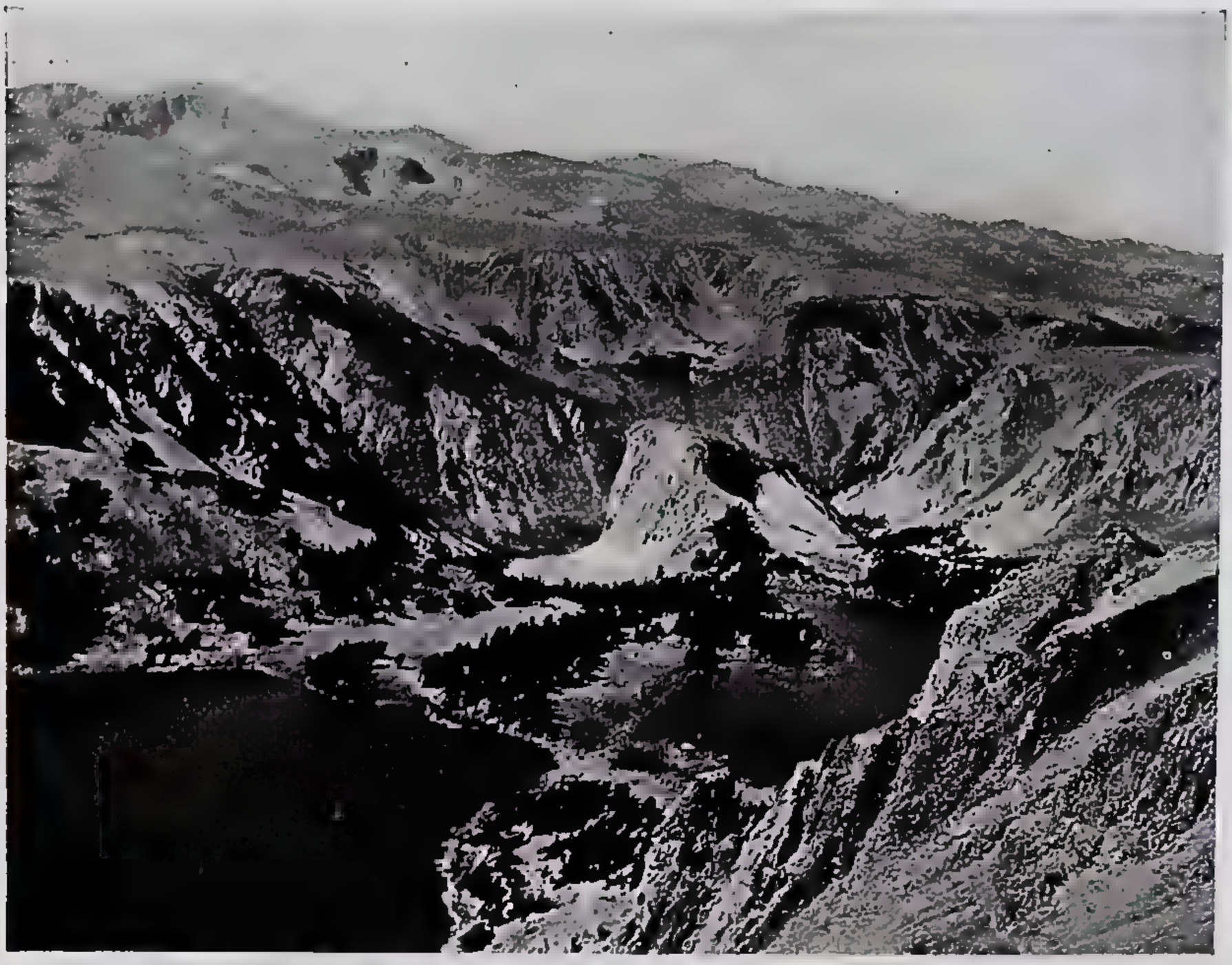

FIGURE 6. The Absaroka Plateau, on the state line between Wyoming and Montana, at about 11,000 feet elevation.

through, the road from Denver had been blocked by drifts and that snow lay three feet deep on the shoulders of Pikes Peak. Nevertheless we turned our efforts to Fairplay, hoping the west slope of the divide had not been so seriously affected. But at Florissant the road became so impassable that we gave up that approach and turned to Florence, intending to go in by way of Salida to Leadville and Fairplay. But fortune had deserted us; the snow still continued, and at Canyon City we were warned to stay out of any pass of more than 10,000 feet elevation.

Lost to us were the seeds of the great blue *Aconitum Bakeri* that grew in the meadows above Alma and of those great drifts of *Anemone zephyra* and *Primula Parryi* in Hoosier Pass. The lingering spicy fragrance of the sky-blue *Gentiana barbellata* haunted us as we sadly turned from the mountains for the last time. We went out to the hills and there from under the snow-drifts dug out our seed of *Melampodium cinereum, Zinnia grandiflora, Machaeranthera tanacetifolia,* and *Sideranthus pinnatifidus.* Bidding Colorado goodbye, we went southward over Raton Pass into New Mexico, for we had learned that even the plains to the east were snowed in and we still wanted seed of *Ipomoea leptophylla.* We obtained it as well as *Fallugia paradoxa* in New Mexico. *Fallugia* is a shrub 5 to 7 feet tall with small three-cleft leaves and rose-like white flowers followed by silky seed-heads of a silvery pink. Bearing eastward into Oklahoma, we went down through the Arbuckle and Ouachita Mountains for seed of *Eryngium Leavenworthii,* one of the finest of its genus although only an annual. Every lobe of the foliage which is present at flowering time is spine-armed as well as the cone-like flower heads which are rich purple with blue stamens. From there we bore eastward across Arkansas and Tennessee, across the Great Smokies into North Carolina, and thence northward to New York.

In a trip of thirteen weeks' duration we had collected more than five hundred lots of seed and had traveled 14,800 miles. Of the seed lots, 140 were of rock-plants, while the remainder were of plants unsuited to rock gardens, although still of horticultural promise, besides a few of purely botanical interest, for exchange.

EDWARD J. ALEXANDER.

HISTORIC VOLUMES DEPOSITED IN LIBRARY

Two historic volumes, the *Register* and the *Proceedings* of the "Botanical Club of the American Association for the Advance of Science," dating from the club's inception in 1883, are now in the Library of The New York Botanical Garden, where they are available for consultation but not subject to loan. They were presented for deposit under these conditions by the Botanical Society of America, the organization which is the outgrowth of the Botanical Club, at its meeting in Atlantic City the last of December.

The story of the organization of a group of thirty botanists in Minneapolis in 1883 is told in the minutes of the first secretary, Prof. J. M. Coulter. Prof. W. J. Beal was the first president. Dr. Charles E. Bessey, who was also at the meeting, for many years remained one of the most active members.

Second to sign the register when it was started at the Philadelphia meeting in 1884 was the venerable Asa Gray. Only a few years later the black-bordered letter of Mrs. Asa Gray, expressing her "very sincere thanks" to the club for the resolution passed at the meeting in Cleveland in August, 1888, was inserted in the book of proceedings.

A few lines below Asa Gray's name on the 1884 page of the register appears the signature of Elizabeth G. Knight, and a bit farther down, that of N. L. Britton. Two years later, among the 91 signatures in the book, the names of Elizabeth G. Britton and N. L. Britton are registered together.

In the Proceedings will be found in brief form part of the story of the beginnings of the American Code of Nomenclature, evolved by the Botanical Club's committee, of which Dr. Britton was chairman, and presented to the Vienna Congress in 1905. This is the last report which is given in the book. The name of Dr. M. A. Howe appears on the same page as a member of the committee on rules for citation.

Up to 1899, the club apparently existed without a treasury. In that year, however, an assessment of 25 cents a member was voted. Out of the $5.75 collected, $2 went out for postage and expressage and $2 to D. T. MacDougal "a/c banquet," leaving the ponderous balance of $1.75. At the same time it was voted to limit papers to ten minutes each. *Then,* the secretary records, the papers of the day were presented.

Familiar names of a number of present-day botanists of the

East, who were then only a short time out of college, appear on the early register of names. In 1885 L. H. Bailey, Jr., then of Michigan Agricultural College, signed his name to the roster for the first time. A few years later he was giving Ithaca as his address, and Ithaca it has been ever since.

The signature of Henry H. Rusby, then of Detroit, first appears in 1887; that of Arthur Hollick in 1891. E. B. Southwick, representing "Central Park, New York City," attended in 1892. John K. Small apparently first became a member in 1896. The next year P. A. Rydberg signed the register. The new century saw the induction of John Hendley Barnhart, who served the club as treasurer and secretary *pro tem* in 1904. His treasury report, the last one in the book, shows a balance of $1.12.

Elmer D. Merrill was one of the group in 1901. When the A.A.A.S. met in New York in 1906, the Botanical Club could count among its members Fred J. Seaver of Iowa and H. A. Gleason of Champaign, Ill., as well as R. S. Williams of New York.

This roster of signatures closes the book, which had been presented to the club by the Philadelphia botanists at the meeting of 1884.

A GLANCE AT CURRENT LITERATURE*

The restored gardens of the Governor's Palace at Williamsburg, Va., are the subject of the entire issue of *Landscape Architecture* for the first quarter of 1937. Arthur A. Shurcliff, who since 1928 has been the landscape architect in charge of the restoration and of city planning in Williamsburg, tells the story and amplifies it with many illustrations.

* * *

More than a dozen garden pools of varied types for different situations are shown in *American Home* for February in an article entitled "Any garden can tuck in a little pool somewhere" by the new horticultural editor, E. L. D. Seymour.

* * *

The phases of the Dutch elm-disease and its treatment are thoroughly covered in Bulletin 389 of the Connecticut Agricultural Experiment Station. Eight plates, of which five reproduce photomicrographs, show the effects of the ailment on the trees.

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* All publications mentioned here—and many others—may be found in the Library of The New York Botanical Garden, in the Museum Building.

Several letters from foreign countries which have had to deal with *Graphium Ulmi* are included in the text.

* * *

Dr. L. H. Bailey treats the genus *Washingtonia* in Fascicle II of Volume IV of *Gentes Herbarum,* occasional papers on the kinds of plants.

* * *

Lilacs, both species and horticultural varieties, are the subject of H. G. Hillier in an imposingly illustrated article in the November *Journal of the Royal Horticultural Society.* Dr. Fred Stoker writes on "Easy-going Cypripediums" and shows several species growing abundantly in his garden.

* * *

Continuing the reports on the botanical results of the Archbold expedition, Francis W. Pennell writes on "New and Noteworthy Papuan Scrophulariaceae" in *Brittonia,* No. 3 of Vol. 2. Other contents of the issue are "Otto Kuntze's New Genera and New Species of Indo-China Plants" by E. D. Merrill; "The Genus Hydrocotyle in Northern South America" and "Studies in the Umbelliferae, V" by Mildred E. Mathias; "Notes on North American Araliaceae" by A. C. Smith; and "A Note on the Genus Themistoclesia" by A. C. Smith and W. H. Camp.

* * *

The Herbarist, the second annual number of which appeared in 1936 as a publication of the Herb Society of America "for use and for delight," proves to be an authoritative as well as an entertaining little book. Topics on a dozen phases of herb history, culture, and use appear in these two initial numbers, which are published at Horticultural Hall, Boston, Mass.

* * *

Another new series of publications on herbs is a four-page pamphlet, the first two numbers of which appeared in October and November, written by Mrs. Rosetta E. Clarkson, who in her garden at New Rochelle, N. Y., raises 170 kinds of herbs as a hobby. Her first issue consists of an article, called "Magic Fragrance," her second, a list of publications on herbs.

CAROL H. WOODWARD.

NOTES, NEWS, AND COMMENT

The plant of *Pelargonium echinatum* shown on the cover and now to be seen in bloom in Conservatory Range No. 1 exhibits a color phase which is rare, if not heretofore unknown, in America. Ordinarily white, the flowers of this specimen are of a clear magenta marked with velvety blackish-purple. Although it has been in cultivation for more than half a century, this South African native is only occasionally seen. The present plant was received from the Royal Botanic Gardens at Kew in 1935.

* * *

Dr. Frederick V. Coville, Principal Botanist in the Division of Plant Exploration and Introduction of the Bureau of Plant Industry of the United States Department of Agriculture, died on January 9 in his seventieth year. He was also Acting Director of the National Arboretum in Washington, which he had been influential in establishing. While Dr. Coville's contributions to botany were largely in the taxonomic field, he was widely known for his development of improved strains of blueberries from wild plants. At the time of his death he was engaged in a revision of the Death Valley flora, which had occupied him during the early years of his career.

* * *

Among recent gifts to The New York Botanical Garden was a check for $1,000 from Mrs. George B. deLong, to be added to the endowment fund.

* * *

Dr. John Hendley Barnhart has been elected President of the Torrey Botanical Club for 1937. On December 21 he was also chosen Editor for the New York Academy of Sciences for the current year.

* * *

Dr. H. A. Gleason was chosen President of the American Society of Plant Taxonomists at its meeting in Atlantic City last month.

* * *

Dr. William C. Steere of the University of Michigan spent the Christmas holidays at The New York Botanical Garden, continuing his work in the Elizabeth Gertrude Britton Moss Herbarium.

"Sex in the Social Organization of the Fungi" was the title of an illustrated lecture given by Dr. B. O. Dodge before the New York Association of Biology Teachers at the American Museum of Natural History, January 15.

* * *

At the monthly conference of the Scientific Staff and Registered Students of the Garden January 13, reports from the Atlantic City meeting of the American Association for the Advancement of Science were given by E. J. Alexander and Doctors B. O. Dodge, Forman T. McLean, Fred J. Seaver, A. C. Smith, A. B. Stout, and H. A. Gleason.

* * *

An interesting set of herbarium specimens has been presented to the Botanical Garden by Dr. Wolfgang von Hagen of New York City, who collected them in the Galapagos Islands during the past year. They include some of the unusual species of the remarkable flora of that region.

REVIEWS OF RECENT BOOKS

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

A New Edition of Hottes' Book of Shrubs

The third edition of "The Book of Shrubs" by this well known author* offers little change from the previous edition, except for some new illustrations. The scope of the book is good, and the general information concerning soils, planting, and propagation is well presented. One would expect to find mention of electric hotbeds, along with the more ancient one of manure, for propagating purposes, both on the score of convenience and uniform results. The use of chemical solutions on cuttings has produced some amazing results. Information on this is the same as given in the first edition. Scientific workers at the Boyce Thompson Institute for Plant Research have made available much new information since then.

The suggested combinations for porch planting have likewise not been revised. The up-to-date planter would improve on these

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* Hottes, Alfred Carl, The Book of Shrubs. Third edition. 438 pages and nearly 200 illustrations. Indexed. A. T. De La Mare Co., Inc., New York City, 1937. $3.

with easily obtained nursery stock. It was surprising to find some early slips still persisting—such, for example, as finding *Enkianthus campanulatus* listed under pink-flowering shrubs, and *Azalea Schlippenbachii* as orange-flowered. To find them described under their correct colors elsewhere in the book serves only to add to the confusion of the novice. Likewise, *Rhus cotonoides,* now *Cotinus americanus,* is as much out of place listed with low-growing plants as it would be in the average foundation planting for which it is recommended.

The Scotch heather, *Calluna,* is deserving of a more extended treatment than given. I have just looked upon a collection of these varieties—beautiful indeed in their winter tints. More people with sandy soils in a sunny place should know of their merits for year-round effect.

Too often one sees the advice given to "avoid manure" for this, that, and the other plant, instead of telling how to use manure properly when obtainable. I'll take all the old cow-manure I can get as a mulch for broad-leaved evergreens, even though the author says *don't.* It is good to see the oak-leaved hydrangea well featured, but one of its attractions is not mentioned—the wine-red tints of the leaves in the fall. For years I have seen doubt expressed as to the hardiness of *Photinia villosa,* and the same is implied here as to its behavior in Massachusetts. I happen to know a 30-year old specimen there that is still going strong in a cold spot, and know several in New York that have shown no injury after temperatures of 30 degrees below zero. Likewise, it was surprising to me to find *Viburnum Carlesii* listed as a tender member of that good family.

One might mention in passing the omission of some very good shrubs that should be mentioned and seen more often. Too many shrub plantings are dull and uninteresting, not so much for lack of good material as for lack of knowledge concerning it. Any work which helps in this direction is to be commended, and the author has done his part.

HENRY E. DOWNER.

A HUMANISTIC BACKGROUND FOR BOTANY

In the words of the author of "Plants and Human Economics," * this volume is an examination which aims to present in readable fashion the historical, economic, and botanical facts which give a humanistic background of reality to the study of botany. The book, which is written by the head of the Department of Botany, University College, Hull, England, is intended for schools and for general reference.

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* Good, Ronald. Plants and Human Economics. 202 pages, illustrated with maps; indexed. Printed in England by The University Press at Cambridge, and in the United States by the Macmillan Company, New York, 1936. $1.75.

Four chapters, "The Nature and Sources of Food," "The Life of the Green Plant," "Facts Limiting Agricultural Production," and "Science and Agriculture," are popular expositions of the basic facts and conditions of agriculture. The limited size of the volume compels brief treatment of these topics with a selection of cases to illustrate important matters, and as a rule these are well chosen. In discussing the scope of hybridization full credence is given to the report that hybrids between the strawberry and the raspberry were obtained, and other references are made to breeding results of little importance. To some it will seem that a more adequate selection of material could be cited.

Several chapters deal with specific crops and products under the following headings: Cereals and Pulses; Vegetables; Salad Plants; Fruits; Beverages; Sugar and Starch; Oil and Fats; Spices; Timber; Coal and Petroleums; Rubber; Resins; Balsams and Gums; Tars and Dyes; Fibers; Alcohol; Drugs; Fodders; Miscellaneous; Products of Lower Plants; and Notes on Vegetable Products. There is a concluding chapter on "The Economic Botany of Great Britain."

The volume is without illustrations except for eight maps which show the distribution of the cultivation of the important crop plants, the distribution of forests, grasslands and deserts, and the location of the important coal fields and oil fields. There is brief mention of all but the very uncommon and local products of plants in nontechnical and popular language.

Both the student of botany and the average reader should find in this volume much information which forms the basis of a "humanistic background" concerning the importance of plants and plant products to the welfare of mankind.

A. B. *Stout*

Thomas' Plant Physiology[1]

This book is interesting both for its virtues and its omissions. It is essentially an elementary treatise on the physical chemistry of plants, yet under absorption no mention is made of the very constructive work of Hoagland and his associates in California; in fact, the statement on page 89 that absorption is governed by concentration of ions inside and outside the cell is definitely disproved by Hoagland's work. Emphasis throughout the book is on European researches, with very brief treatment of the extensive work done in the United States in the fields of absorption, mineral nutrition, transpiration, nitrogen metabolism, etc. The discussion of growth substances (auxins) is an excellent treatise on recent advances in plant physiology made in Great Britain, and the bibliography has references mainly to English authors.

Forman T. McLean.

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[1] Thomas, Meirion, Plant Physiology. 494 pages, illustrated; indexed. P. Blakiston's Son & Co., Philadelphia, 1935. $5.

THE NEW YORK BOTANICAL GARDEN

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Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pages and 601 figures. 1932. Price, $5.50 postpaid.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages, illustrated. 1935. $1.65.

Flora of Bermuda, by Nathaniel Lord Britton and others. 585 pages with 494 text figures. 1918. $3.50.

A Text-book of General Lichenology, by Albert Schneider. 230 pages. 76 plates. 1897. $2.50.

Periodicals

Addisonia, semi-annual, devoted exclusively to colored plates accompanied by popular descriptions of flowering plants; eight plates in each number, thirty-two in each volume. Now in its twentieth volume. Subscription price, $10 a volume (two years). Not offered in exchange. Free to members of the Garden.

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Direct all orders to The New York Botanical Garden, Bronx Park, New York, N. Y.

* * *

DIRECTIONS FOR REACHING THE BOTANICAL GARDEN

The New York Botanical Garden is located in the Bronx, immediately north of the Zoological Park at Fordham Road, and at the south end of the Bronx River Parkway. It may be reached by local trains from Grand Central Terminal to the Botanical Garden Station (200th Street).

To reach the Garden by the Elevated and Subway systems, take the Third Avenue Elevated to the end of the line (Bronx Park Station); from the East and West Side subways, transfer from the Lexington or Seventh Avenue line to the Third Avenue Elevated at 149th Street and Third Avenue. By Eighth Avenue subway (Independent system) take a C or CC train to Bedford Park Boulevard (200th Street), then walk east to the Garden.

To come by motor from the city, drive north on Grand Concourse to Bedford Park Boulevard (200th Street), turn east there, and cross the railroad bridge into the Garden grounds.

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of
THE NEW YORK BOTANICAL GARDEN

Springtime display of Easter lilies in Conservatory Range No. 1.

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

MARCH, 1937

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THE HERBARIUM

Virtually every kind of plant which is native to North America, as well as a majority of the plants of the rest of the world, is represented in the vast herbarium of The New York Botanical Garden. For many years from every continent and its adjacent islands, thousands of plants have been carefully gathered, pressed, mounted, and labeled, then stored in convenient order for the use of students and scientists.

Growing at an average rate of 40,000 specimens every year since The New York Botanical Garden was founded, this herbarium now contains more than 1,800,000 specimens, which make it second in size in America and one of the largest herbaria in the world. Not only flowering plants, but also ferns, mosses, algae, and fungi are included. The collection of fungi alone numbers more than a quarter of a million specimens, and the mosses are almost as numerous. Cultivated plants are kept in a separate section and, for the benefit of local botanists, another special collection consists of the plants which are native to the vicinity of New York.

The entire herbarium is arranged according to a modern system of classification so that all related plants are housed near one another for ready comparison. Practically every species included is represented not by a single specimen but often by a dozen or more, which show the variation in the structure and appearance and the geographical distribution of each kind.

Every specimen in the herbarium has been identified by some taxonomist who examined it minutely, restoring certain portions to their natural size and contour by slow boiling, scrutinizing the smaller parts under the microscope, and comparing the whole with others which it might resemble. Thus was its place in the present system of classification determined and its specific name acquired.

Every year thousands of plants, some fresh, some dried and pressed, are named at The New York Botanical Garden. The accuracy of the determinations is checked by comparison with specimens already in the herbarium.

This, in fact, is the principal use of the herbarium: to aid taxonomists in the identification of plants. Geneticists, physiologists, horticulturists, pathologists, and students in other branches of botany also utilize the herbarium regularly, for without it they would often find it difficult or impossible to name correctly the plants with which they work.

Herbaria such as the one at The New York Botanical Garden are one of the indispensable means by which the science of botany is able to progress.

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FACTS AND FANCIES ABOUT OUR ROYAL PALM

Few among the hordes who trek to southern Florida in the winter have failed to notice the royal palm as a cultivated tree, for their attention is promptly attracted by this very unusual subject which seems to be made up of a concrete column for a trunk and a large feather duster for a crown. Inquiry reveals that this is the royal palm, *Roystonea regia,* by far the most striking member of the Palm Family in Florida.

PREHISTORY AND HISTORY

A note printed last summer, entitled "Royal Palms in Upper Florida," emphasizes the fact that the royal palm in Florida, which is believed to have had great prevalence at one time, was nearly exterminated during the white man's pioneer period.

An "undevastated Florida" of an earlier age is pictured, "canopied by thousands [thousands would scarcely represent a needle in a haystack by comparison] of royal palms, with their huge pendent clusters of grape-like purple fruits feeding great numbers of wild turkeys, deer, and other game." [1]

This picture is what it is assumed Ponce de Leon may have seen while hunting for the Fountain of Youth before the pioneer period of cabbage-cutting and grass-burning which "lasted more than three centuries." However, cabbage-cutting was probably already in vogue for thousands of years, for the aborigines would not have omitted this important source of food from their limited cuisine, and furthermore they may even have used the bud of the royal palm as well as that of the cabbage-tree (*Sabal Palmetto*) and other palms for food. Perhaps they were thus partly responsible for the assumed depletion of the royal palm growth, for this tree is sometimes known as the cabbage palm. As for grass-

[1] Royal Palm in Upper Florida, O. F. Cook, Science 84: 60, 61. 1936.

FIGURE 1. Looking west toward Royal Palm Hammock, now in the Royal Palm State Park, Dade County, Florida. Several palms, some more than 140 feet tall, tower above the growth of broad-leaved vegetation. This hammock and all the surrounding region lies within the boundary of the proposed Everglades National Park.

burning we have documentary evidence that this deplorable custom was practised by the aborigines, at the time of the discovery of the New World, for it is recorded:

"Those from further inland have another remedy, just as bad and even worse, which is to go about with a firebrand, setting fire to the plains and timber so as to drive off the mosquitos, and also to get lizards and similar things which they eat, to come out of the soil. In the same manner they kill deer, encircling them with fires, and they do it also to deprive the animals of pasture, compelling them to go for food where the Indians want." [2]

Before the advent of men on the scene, nature itself did the grass-burning. So it is clear we must stretch our imagination many thousands of years back of Ponce de Leon's time to envision a possible Florida canopied by royal palms. At least, no intimation of these royal-palm canopies is given in the records of the early travelers before or after Ponce de Leon's poetical expedition.

Passing from fancies to facts, or from the prehistoric to the historic, we find several pieces of recorded evidence showing the status of the royal palm in Florida from 1792 to the present, or for about a century and a half. The first printed record by William Bartram follows:

"The Indian not returning this morning, I set sail alone. The coasts along the St. John's River, south of Lake George, on each side had much the same appearance as already described. The palm-trees here seem to be of a different species from the cabbage tree; their straight trunks are sixty, eighty or ninety feet high, with a beautiful taper, of a bright ash colour, until within six or seven feet of the top, where it is a fine green colour, crowned with an orb of rich green plumed leaves: I have measured the stem of these plumes fifteen feet in length, besides the plume, which is nearly of the same length." [3]

This statement is often questioned both as to its veracity and as to whether the trees represented are the royal palm. The royal palm is quite sensitive to cold. Trees are sometimes killed during freezes right in the heart of their great abundance. Further along it will be seen that Dr. Cooper suggested that cold may have killed the Bartram colony during the freezing weather of 1835. Such an instance is known to have occurred in the Big Cypress Swamp in 1894-5, just sixty years later. Three tall royal palms grew in a hammock near a point of cypress about the headwaters

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[2] The Journey of Alvar Nuñez Cabeza de Vaca. Translation by Fanny Bandelier, 92-93. 1905.

[3] Travels in North and South Carolina, Georgia, East and West Florida, 113-114. 1792.

of the river on which the settlement of Everglades is situated. They flourished up to 1894. The cold of the two freezes, December 1894 and January 1895, killed them. Ten years ago the trunks, below the ferule of leaf-bases, were still standing and sound, though slowly decaying. The same fate may have befallen the Bartram colony. This is pure supposition. However, inquiries in the vicinity of Astor, a settlement midway between Lake George and Dexter Lake, brought out the information, though somewhat hazy, that several generations ago there was a factory in that vicinity that made walking-canes of palm wood. Thus the wood of the Bartram royal palms may now be scattered far and wide.

Fifty years after the Bartram printed record, or seventy years after the actual discovery, Thomas Nuttall records that:

"In the islands of the Everglades, considerably inland in East Florida, we have been informed that a Palm about 90 feet high, forming a magnificent tree, has been seen, but of this plant we have been unable to obtain, as yet, any further account." [4]

This information was most likely verbal and came directly or indirectly from army officers, many of whom by that time had penetrated the remote parts of the Ten Thousand Islands and the Everglades during the Seminole wars.

From about 1860 the records of this palm become more definite. J. G. Cooper wrote:

"The Palm mentioned by Nuttall in the introduction to his Sylva is found, as I was informed by several persons, in large groves, between Capes Sable and Romano, and one tree three miles north of Fort Dallas. It was called 'Royal Palm,' and said to grow 120 feet high. It is probably the Bahamian 'Cabbage Palm' (*Oreodoxa oleracea,* Mart.). This was evidently the palm found by [William] Bartram, in 1774, near Lake Dexter, on the St. John's river, latitude 28° 55′, and to all appearances wild. Some were ninety feet high, with 'plumed' (pinnate) leaves thirty feet in length. (Travels, page 114.) As no one has seen them lately, they may have been destroyed by the severe frosts of 1835." [5]

This information doubtless came to Dr. Cooper while he was at Fort Dallas from the men who had participated in the Seminole wars and later settled at Fort Dallas (later Miami) when they left the army. The army in Florida was brought into close contact with palms and the men evidently took notice of them, for

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[4] North American Sylva IV: viii. 1842.

[5] Annual Report, Smithsonian Institution, 1860: 440. 1861.

FIGURE 2. An isolated palm in flower in the jungle of broad-leaved trees in Royal Palm Hammock, Florida. Rodents and weevils are often so abundant and active where the royal palm grows that scarcely one of the myriad seeds produced annually by a tree ever grows to maturity.

some of them remained in the service and participated in early exploring parties in the Far West. It is recorded that:

"Several scattered objects were seen projected against the cliffs, hailed by the Florida campaigners, some of whom were along, as old friends. They were cabbage-trees (*Washingtonia*), and marked the locale of a spring and a small patch of grass." [6]

There can be no doubt about the discovery of the royal palm by Bartram. The only questions are these: Were the trees along the St. Johns River indigenous, or were they introduced by the native Florida aborigines, not the exotic Seminoles, as a result of seeds brought from further south? It seems likely the aborigines cultivated the palm, for on the marl mounds of an ancient site of aboriginal activities three miles back of the one-time settlement of Flamingo, Cape Sable, stand royal palms which are apparently descendants of parents planted there before these aborigines were exterminated by the Spanish adventurers. The Cooper record is interesting in indicating that the palm may have been native on the lower eastern coast. However, although we are likely to think of Miami as a recent development, it is only a modern development. When it was Fort Dallas in the earlier part of the past century there was much activity thereabouts, and the lone tree may have been the result of seeds brought in during the activities of the army in peninsular Florida. The matter might rest here, but in the eighties it became a little fogged. An old settler accidentally stumbled on a colony of these palms in the mangrove swamp south of Little River, while hog-hunting.[7] *Question*: Did this represent a native colony or was it progeny of the lone tree mentioned in the Cooper note?

Nearly a quarter of a century after the Cooper note appeared, C. S. Sargent reported that the royal palm was:

"A tree 18-30 meters in height, with a trunk 0.60 meters in

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[6] Notes on a military reconnaissance from Fort Leavenworth to San Diego in California 103. 1848.

[7] Ralph M. Munroe in The Commodore's Story, 145. 1930. In a letter just received from Mrs. Mary Louise Lott of Miami. the following information is given: "When John Soar came to Miami in 1892 (September) there was a grove of about twelve royal palms growing near the mouth of Little River on the south side of the river north of Dr. Simpson's place and just south of "old" Little River. Some of these palms had at least 20-foot bodies, were seeding well, and were apparently 25 years old—or about that. The grove had been larger but a blight had killed some (trunks still standing) and others were dying. They had all disappeared about 1915. People generally did not know this group of palms existed and Mr. Soar feels certain no one living in Miami at that time knew of their origin. He does not think they were planted but that the seeds were washed into that low land; it often flooded during storms."

diameter; rich hummocks (*hammocks*), often forming extensive groves; in Florida rare and local." [8]

Previous information was summed up by C. S. Sargent, as follows:

"This species, which is common in Cuba, extends into southern Florida, where it inhabits two or three hummocks [hammocks] on Rogue's [Rogers] River, about twenty miles east of Caximbas [now spelled Caxambas] Bay on the west coast, Long's [Long] Key [This is the Bucaneer Palm (*Pseudophoenix vinifera*).] and the shores of Bay Biscayne near the mouth of Little River. The presence of a lofty palm in southern Florida was hinted at more than sixty years ago, and the fact is mentioned in the preface to Nuttall's North American Sylva, but it was not until 1859 that this Palm was known to be *Oreodoxa* [*Roystonea*] *regia*. In that year Dr. Cooper found it on Bay Biscayne, and twenty years later Mr. A. H. Curtiss established the fact of its presence on Rogue's [Rogers] River and Long's [Long] Key." [9]

Discoveries after the end of the past century have revealed only outlying colonies of former known centers of distribution.

Native Growth

The following information about the recent and present status of the royal palm in Florida was derived from personal contact of the writer with the veterans of southern Florida settlements and from notes received from the best informed sources, namely J. F. Jaudon and William W. House.[10]

At the present time the royal palm in Florida does not grow naturally north of about latitude 26 degrees. (Miami lies just south of 26 degrees; Fort Lauderdale a trifle north.)

Whatever growth may have existed naturally on the Atlantic side of Florida is extinct. The Gulf side including the Bay of Florida now maintains the native growth. There are four main areas: I, Royal Palm Hammock in Dade County; II, the Cape Sable region, extending from Taylor River to the Cape; III, the Ten Thousand Islands; IV, the Big Cypress Swamp. The first area contains relatively few palms; the second has many, but in small colonies such as Cape Sable and vicinity, Madeira Bay, and Taylor River; in the third area the numbers increase, and in the

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[8] Report on the Forests of North America, 218. 1883.

[9] Garden and Forest **9**: 152. 1896. References to this palm are also printed in Silva **10**: 31, 32. 1896.

[10] Both Captain Jaudon and Mr. House have lived with the Indians in the most remote wilderness of southern Florida, and the House family have been residents of Naples and Chokoloskee Island for three generations.

FIGURE 3. An avenue of native royal palms at Coconut Grove, Florida. These young cultivated palms are the direct progeny of palms of Royal Palm Hammock, Dade County, and of the Ten Thousand Islands, Collier County.

vicinity of the rivers of the Ten Thousand Islands—for example, the Sweetwater, Lossmans, Rocky, Rogers, Broad, and Harney—the palms grow by the hundreds. The fourth area is the hotbed of the royal palm; here the growth may be recorded by the thousands. The palms are particularly abundant in the vicinity of Palm Creek and the Fackahatchee and Fackaunahatchee.[11] In passing it is interesting to note that the colonies of royal palms are inseparable from water courses. Were the seeds floating in the waters of the Gulf Stream driven up the rivers during storms and hurricanes?

Fortunately, the more remote parts of the Cape Sable region, the Ten Thousand Islands, and the Big Cypress Swamp are the most inaccessible parts of the United States where vegetation thrives.

Cultivation

Toward the end of the past century, when the southern parts of the Florida peninsula, first the western and later the eastern coast, became generally accessible, the native royal palm sprang into popularity. Its early mysterious existence gradually faded away and it became common property.

Commercialism promptly made inroads. First the fruits were collected. Frequently a palm tree a hundred feet tall would be cut down just to get the seeds for nursery stock. Then the palm became so popular that full-grown trees were demanded. Since the beginning of this century many thousands of royal palms, ranging from a few inches to a hundred feet tall have been removed from their native haunts to the cities, towns, and gardens of southern peninsular Florida. A few hundred palms were moved from the western coast to Miami before the end of the past century. The lone palm that stood near the forks of the Miami River in the early part of this century may have been derived from this source.

In passing, it may be of interest to give a partial argument against the royal palm being indigenous on the lower eastern coast of Florida. Bernard Romans, who published a "Concise Natural History of East and West Florida" in 1775, with a map, fails to mention the royal palm in his list of trees, although he gives a quite accurate map of Bay Biscayne and of the Miami

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[11] The latter two names are rivers. The ending "hatchee" is Indian for river.

River with its north and west forks. On the other hand, the royal palms may have eluded his attention, for it was many years after the white man settled in that region before the colony of these trees at the mouth of Little River was discovered.

The royal palm is justly popular and very generally cultivated, the seeds sprouting readily and the seedlings making exceptionally rapid growth, if they do not succumb to the ravages of rodents or weevils. Should the native growth be exterminated by hurricanes, floods, frost or fires, by gnawing insects or woodpeckers, which sometimes drill too many holes in the trunks, the tree will long survive within the range of its hardiness as a street-tree and an ornamental in gardens. However, to be on the safe side to prevent its extermination, large groves should be set out in otherwise useless areas and allowed to go native. Conservationists please take notice!

JOHN K. SMALL.

CITRUS FRUITS FROM FLORIDA ON EXHIBIT

More than sixty varieties of citrus fruits from Florida were put on exhibit in the Museum Building this month. Each one is labeled with its varietal name, besides a brief description of the character of the fruit, particularly from the consumer's point of view.

The grower of citrus fruits is quite as careful in the selection and verification of the trees for his orchard as any grower of grapes is for his vineyard. There seems no good reason, therefore, why the northern purchaser should not act with equal intelligence and discretion in obtaining citrus fruits for the table. The competent housewife always asks for Greenings, Baldwins, Ben Davises, or some other special sort when she is buying apples; yet not one in a hundred times will a purchaser be heard to call for a citrus fruit under its varietal name. Some specification as to sweetness, juiciness, or thickness of rind will often be given, but usually nothing more.

The resident in such producing regions as Florida and California soon begins to demand special varieties by name; but even there he rarely goes very far in learning to distinguish any but a few of the more important varieties.

That is why The New York Botanical Garden has assembled this collection of the more important commercial varieties of oranges, grapefruits, lemons, mandarins, kumquats, and their hybrids: the object is to give the public the opportunity of studying the appearance and the quality of each sort. Nearly half of the 150 recognized and named varieties are being exhibited.

In each jar in which the specimens have been preserved, one or more whole fruits on leafy twigs are shown, besides one fruit in cross-section with inner surface and stem-end both carefully displayed. In some cases, important differences are to be noted in the leaves of varieties, and the calyx, at the stem-end, is regarded as an important differential structure. In the descriptions of varieties, the color and character of surface, the shape, especially as to grooves at the base and projection or depression at the summit, the number and form of seeds, thickness and coloration of rind, form of juice-vescicles and color of juice, and amount of "rag," as the tough residue, after expression of the juice, is called, are carefully differentiated.

On the labels for the exhibit, the general classification of nomenclature employed is that found in Hume's work on citrus cultivation. The following groups are included in the collection:

The sweet oranges (*Citrus sinensis* Osbeck)
- Group 1, Spanish oranges, 8 varieties
- Group 2, Mediterranean oranges, 11 varieties
- Group 3, Navel oranges, 3 varieties
- Group 4, Blood oranges, 1 variety

The sour oranges (*C. Aurantium* L.), 2 varieties
The pomelos or grapefruits (*C. paradisi* Macf.), 11 varieties
The mandarins or tangerines (*C. nobilis* Lour.), 7 varieties
The kumquats (*Fortunella margarita* and *F. Hindsii*)
The citron (*C. medica L.*)
The lemons, sweet and sour (*C. Limonia* Osbeck), 3 varieties
The limes (*C. aurantifolia* Swingle), 2 varieties
The tangelos (hybrids of *C. paradisi* and *C. nobilis*), 6 varieties
The citranges (hybrids of *C. sinensis* and *Poncirus trifoliata*), 2 varieties
The citrangequat (hybrid of the citrange and the kumquat)

It is hoped that the flowering twigs of most of the specimens can be added in the spring, when the exhibit after having been on special display in the rotunda of the Museum Building, will become part of the Garden's permanent collection of economic plants.

H. H. Rusby.

TWO NEW DAYLILIES

Among the daylilies obtained by breeding at The New York Botanical Garden, two outstanding yellow ones have recently been named. These have been propagated by the Farr Nursery Company, which will introduce them this spring to the horticultural market.

I. The Saturn Daylily

The Saturn daylily was obtained after several generations of selective hybridizations which involved as parents *Hemerocallis flava, H. fulva* clone Europa, a wild plant of *H. fulva* from Japan, and *H. multiflora.* The general habit of the plant is that of an erect *H. multiflora,* only more robust and with larger flowers of delicate fulvous colors. At New York the period of blooming has been from about June 15 to July 15.

The foliage is nearly dormant in winter. The scapes are much branched and stiffly erect to a height of from 3 to 4 feet. The flowers are numerous, about 3 inches across, widely spreading and full; the throat is apricot-yellow; the petals have an eye zone of vinaceous rufous, beyond which is an area of ochraceous orange, and there is a marginal border of almost clear apricot-yellow. The sepals are somewhat less strongly eyed and they are reddish fulvous on the back. The marginal band of paler color in the open flower is somewhat more noticeable than in other seedlings or named clones which the writer has thus far seen.

II. The Circe Daylily

The Circe daylily has been selected as an especially attractive plant from a large number of somewhat similar seedlings which have yellow flowers and bloom in early and mid-July. The scapes stand from 3 to 4 feet tall, and they are stiffly erect and somewhat branched. The flowers are full, about 3½ inches in spread and light yellow or almost lemon-yellow in color. In its particular combination of characters the Circe daylily does not closely resemble any of the various yellow-flowered named clones in bloom at the same time. The ancestry comprises six generations of selective breeding with hybridizations that include *Hemerocallis flava, H. fulva* clone Europa, *H. Thumbergii* and *H. aurantiaca.*

A. B. Stout.

Two new daylilies being introduced this year. At the left, a flower of the Saturn daylily; right, a flower of the Circe daylily. Both are shown natural size.

ORIENTAL PLANES IN NEW YORK CITY

Although *Platanus orientalis* L., the true oriental plane, is stated on excellent authority to be hardy as far north as Massachusetts, the records of its being planted in our vicinity are surprisingly few. The "oriental plane" of common cultivation is almost invariably the London plane (*Platanus acerifolia* Willd.).

At this date the writer knows four trees of the true oriental plane in New York City. Others may yet be found. Two trees of which the northernmost one is most likely *P. orientalis* var. *liquidambarifolia,* stand in Central Park, Manhattan, near the retaining wall on Central Park West, slightly north of 102nd Street. Another, already mentioned in this Journal (October, 1936) grows in Morningside Park, Manhattan, near the eastern boundary of the park, in line with 112th Street. A fourth tree is cultivated in the Brooklyn Botanic Garden. All these specimens are mature plants probably of the same age and of the same origin. They bear fruit regularly although they show indication of having suffered and of suffering somewhat from frost.

The leaves of the oriental plane vary bewilderingly, and many are the varieties described from the leaf alone. On the whole, however, the outline of the blade has a character of its own. A glance at the accompanying photograph will tell more than a long description. In the oriental plane the blade is mostly deeply lobed and distinctly jagged. Young shoots may bring forth leaves that are as shallowly lobed as those of the London plane, but this last, so far as the writer knows, nowhere has the deeply cut-in leaves that are typical of the oriental plane. Usually the leaf of the oriental plane has a thinner texture than that of the London plane.

The fruits of the oriental plane are borne in long clusters of two to five, seldom two to three, "heads". Each "head" measures 1-1½ inch across, which is a trifle less than the usual size of the fruit of the London plane.

The oriental plane is native to the Balkans, to Asia Minor, and to the islands of the Aegean Sea and may dwell on mountains up to 5,000-6,000 feet high. This range, called the Eastern Mediterranean by most authors on horticulture, is mistakenly supposed to be warm or temperate throughout. Very severe winters hold sway in Albania, Serbia, Bulgaria and the Anatolian tableland. In

cultivation the oriental plane is hardy at least as far north as Berlin, Germany.*

The Eastern Mediterranean region matches the Carolinas and Georgia in that both sections have harbored numerous northern forms of plant-life compelled to seek warmer climates during the Tertiary and Quaternary glaciations. With the return of less

Characteristic leaves of plane trees. Top row: leaves of the London plane (*Platanus acerifolia* Willd.). Middle and bottom rows: leaves of the oriental plane (*Platanus orientalis* L.) from the trees in Central Park, Manhattan.

severe conditions many of these plants have tended to migrate again north, or can be cultivated north of what is properly their range. It is not more surprising, therefore, to find the oriental

* For this and other valuable intelligence the writer is indebted to a friend, Dr. O. Schwarz, Botanische Garten, Berlin-Dahlem.

plane in our parks than it is to find in our gardens Fraser's magnolia, the big-leaf magnolia, the red linden, the silver linden, the Georgia buckeye and other such "Eastern Mediterranean" or "southern" species. Naturally, plants that are somewhat tender with us must be treated with greater care than the usual run of hardy trees and shrubs. It is interesting to note that all the oriental planes mentioned above are set on dry slopes.

The oriental plane, it becomes clear, is less rare with us than is generally supposed, and can fairly easily be grown where some specimen is desired either for educational purposes or for ornament.

LEON CROIZAT.

MYCOLOGIA

Mycologia, the official organ of the Mycological Society of America, published by The New York Botanical Garden under contract with the society, has just closed the most successful year in its history. According to our official records the total income for 1936, including the interest on endowment, estimated at $115, amounted to $5,849.78. With a surplus of $494.07 brought forward from 1935, there was on hand during 1936 the sum of $6,343.85. The cost of publishing the current volume of 633 pages, plus incidental expenses pertaining thereto, amounted to $3,463.13, leaving a balance on hand of $2,880.72. A large part of this amount was obtained through a special effort to sell the back sets of *Mycologia.* With the permission of the Board of Managers of The New York Botanical Garden, $2,500 of this amount was transferred to the restricted Mycologia Endowment Fund, the interest on which is to be used for the publication and expansion of the periodical. The balance of $380.72 was carried forward to 1937. The restricted Mycologia Endowment Fund now amounts to $4,500, all of which has been accumulated during the past four years. Of this amount, $2,000 was donated by an anonymous friend to be expended on *Mycologia* in any way the managing editor might see fit, while the remaining $2,500 has been accumulated through the sale of back sets, including the Twenty-four Year Index. It is hoped that this endowment may be gradually increased until *Mycologia,* now one of the outstanding journals of its kind in the world, can be placed on a firm financial footing.

FRED J. SEAVER,
Managing Editor.

A GLANCE AT CURRENT LITERATURE*

To study the influence of climatic environment on the life and development of living organisms, particularly plants, is declared to be the major effort of the Desert Laboratory at Tucson, Arizona (with the central laboratory at Stanford University in California) in the latest annual report of H. E. Spoehr as Chairman of the Division of Biology of the Carnegie Institution of Washington. In this work, different regions, different types of material, different viewpoints, and methods of approach are utilized.

Included in the report is a study of the species problem, using the genus *Madia* as the basis, in an attempt to reveal how taxonomic characters may be altered by environment. Other articles are on the yellow pigment in photosynthesis, on tree-rings as climate indicators, and on paleobotany. In connection with some of the studies, explorations have been made in Sonora, Lower California.

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Intended as a preliminary to more extensive work on the flora of Fiji, Dr. A. C. Smith's "Fijian Plant Studies" was published toward the end of 1936 as Bulletin 141 of the Bernice P. Bishop Museum of Honolulu. In this paper, which includes only new or rare species, Dr. Smith and his collaborators report three families and 26 genera for the first time from the Fiji Islands, propose five new genera and two new sections, name 91 new species and seven new varieties, and propose 27 new combinations and five new names. On his year's trip in Fiji, which was reported in the JOURNAL for December, 1934, he visited eight islands and collected 2,008 numbers.

* * *

"The Tertiary Floras of Alaska" by the late Arthur Hollick of The New York Botanical Garden has appeared as Geological Survey Professional Paper No. 182 of the United States Department of the Interior. A chapter on the geology of the Tertiary deposits, by Philip S. Smith, is included. The book contains 122 plates, each consisting of from one to sixteen clear-cut photographs of the specimens treated in the work.

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* All publications mentioned here—and many others—may be found in the Library of The New York Botanical Garden, in the Museum Building.

A translation of Alfred Rehder's "Notes on the History of the Introduction of Woody Plants into North America" appears in the *National Horticultural Magazine* for October. Three periods are designated: (1) up to the eighteenth century, when only fruit trees and a few ornamentals were brought in; (2) the period of John Bartram in Philadelphia and Robert Prince on Long Island; and (3) the period from 1861 on, when Chinese and Japanese plants began to come directly from the countries of their origin, instead of by way of Europe, as formerly.

* * *

Robert Hagelstein has contributed "A Critical Study of the Mycetozoa of Long Island" to the November-December number of *Mycologia,* treating 35 genera with complete descriptions of species, giving the location of every specimen found, and adding notes of definite value to the collector.

* * *

George L. Slate writes on "Small Fruits for the Home Garden" in the *Gardeners' Chronicle of America* for February.

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Orchid culture is being encouraged in Australia with the appearance of the *Australian Orchid Review,* official organ of the Orchid Society of New South Wales.

* * *

Five reasons why the florist and nursery industries need such specialists as "plant doctors" as consultants and aids in their business of growing plants successfully are emphatically stated by Alex Laurie in the *Florists' Exchange* for February 6. The paper was originally given at the short course for nurserymen at Ohio State University in January.

* * *

How a good crop of strawberries was gathered in February and early March is told by J. W. M. Roodenburg of Wageningen, Holland, in the *Journal of the Royal Horticultural Society* for December. The plants, which were of the Deutsch Evern variety, were exposed to neon light from 10 p.m. to 6 a.m. nightly beginning October 7. They had been potted July 19 and housed October 2. Another essential factor in producing this midwinter crop was found to be to keep the plants from becoming dormant after their summer growth.

Donald Culross Peattie is the author of a brief pamphlet entitled "Old-fashioned Garden Flowers," written in the interest of more than two dozen worthy plants which have gone out of style in present-day gardens. It is published as Botany Leaflet 19 of the Field Museum of Natural History.

* * *

In a treatise on the indentification of woods with conspicuous rays, H. E. Dadswell and S. J. Record describe 50 families in which broad rays are a leading characteristic of the wood. The work appears in *Tropical Woods* issued December 1. Photographs of enlarged cross-sections of typical plants in 18 of the families are shown.

* * *

His experiences in searching for alpine plants in the Caucasus are recorded by W. E. Th. (Will) Ingwersen in the *Journal of the Royal Horticultural Society* for October.

* * *

The latest work of the Boyce Thompson Institute on the use of hormone-like substances in plant growth is reported by A. E. Hitchcock in the December *Bulletin of the Horticultural Society of New York*. In the same issue Mrs. J. Norman Henry writes briefly on her plant-collecting expedition in northern British Columbia. Both papers were subjects of recent lectures at the Horticultural Society.

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The completed Part 1 of Volume 1 of A. J. Grout's "Moss Flora of North America North of Mexico" was published at Newfane, Vt., in October.

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The new succulent house of the Missouri Botanical Garden, which contains a large collection of South African succulents planted naturalistically on either side of a winding path, is illustrated in the October *Cactus and Succulent Journal.*

* * *

Part III of Volume XII of *Memoirs of the Carnegie Museum* contains reports on the algae, fungi, lichens, bryophytes, ferns, and flowering plants of Southampton Island, Hudson Bay, collected on the exploration sponsored by John Bonner Semple in 1929-30.

One hundred and seven species of woody plants are briefly described and individually located on a map of Kissena Park in Brooklyn Botanic Garden Leaflets No. 3-5, Series XXIV. Leon Croizat is the author of the leaflet, which is entitled "The Rare Trees and Shrubs of Kissena Park, Flushing, L. I., N. Y."

* * *

The first of a series of studies on the genus *Dianthus* by Dr. Fritz Lemperg of Hatzendorf, Austria, written in English and published by the Botanical Garden of Göteborg, Sweden, gives analyses of 52 species in the series Barbulatum. The studies have been made so far as possible from living plants, with types and other herbarium specimens also being examined.

CAROL H. WOODWARD.

SPRING LECTURES AT THE GARDEN

An illustrated address on "Fragrance in Flowers" by Dr. Forman T. McLean opened the spring series of free Saturday afternoon lectures at The New York Botanical Garden, March 6. Dr. Harold N. Moldenke is giving a travel talk on Switzerland the afternoon of March 13. The lectures are given at 3:30 P.M. and last one hour. Other topics scheduled for the season are as follows:

March 20 "Mushrooms, Edible and Otherwise," Dr. William S. Thomas, Physician and Author.

March 27 "Growing Healthy Roses," Dr. B. O. Dodge, Plant Pathologist, and Mr. P. J. McKenna, Foreman Gardener.

April 3 "April and May in the Rock Garden," Mr. T. H. Everett, Horticulturist.

April 10 "Principles of the Landscaping of Home Grounds," Mr. A. C. Pfander, Assistant Superintendent.

April 17 "South African Flowers," Mrs. Sarah V. Coombs, Author.

April 24 "Spring Wild Flowers," Dr. John Hendley Barnhart, Bibliographer.

May 1 "Plant Names and Their Origins," Dr. H. A. Gleason, Head Curator.

May 8 "Our Native Ferns," Dr. Albert C. Smith, Associate Curator.

May 15 "Colorado, Wyoming and South Dakota," Dr. Fred J. Seaver, Curator.

May 22 "Origin and Improvement of Cultivated Plants," Dr. A. B. Stout, Director of the Laboratories.

May 29 "Flesh-eating Plants," Dr. H. Beaman Douglass, Physician.

NOTES, NEWS, AND COMMENT

The Horticultural Club of Boston assembled at the Parker House March 3 to hear an address by T. H. Everett on the Thompson Memorial Rock Garden. More than a hundred colored slides made at The New York Botanical Garden were used to illustrate the lecture.

* * *

Dr. Herbert Francis Marco of the United States Forest Service is spending several months at The New York Botanical Garden doing laboratory research in connection with special studies in the breeding of forest trees, a work in which Dr. A. B. Stout is coöperating.

* * *

"Recent fern studies at The New York Botanical Garden" was the subject of Dr. John K. Small at the monthly conference of the scientific staff and registered students of the Garden February 10. Dr. Harold N. Moldenke spoke on "Trailing Types in European Herbaria."

* * *

Benjamin F. Bush, botanist and postmaster, died February 14 at his home at Courtney, Mo., at the age of 79. The author of several botanical works, he was also an indefatigable plant collector, particularly in the Ozark region. Several thousand of his specimens from Missouri and nearby states are contained in the herbarium of The New York Botanical Garden.

* * *

Boris A. Krukoff has again returned from Brazil to spend several months at The New York Botanical Garden. He has brought with him about 1,500 collection numbers of plants in ten or more sets to be distributed. The collection, which was made chiefly in the Amazon valley near the Peruvian border, is especially rich in the genera *Strychnos* and *Lonchocarpus*.

* * *

Dr. Edmund W. Sinnott will be one of the speakers at the meeting of gourd gardeners to take place at the Gardens of the Nations in Rockefeller Center, March 17 at 3:30 p.m.

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Continued warm weather during the latter part of the winter brought many trees and shrubs into bud and early bloom and in the rock garden made certain crocuses appear three weeks ahead of last year's schedule. *Crocus chrysantha* varieties E. P. Bowles and Canary Bird, also the delicate lavender *Crocus Tomasinianus*, were in bloom on February 24. Last year they first opened March 17. *Crocus Korolkowi*, another yellow species, was in continuous bloom from January 18.

REVIEWS OF RECENT BOOKS

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

A Coulter Textbook

Dr. Coulter undoubtedly was confronted with a most difficult task—that of writing the general botanical text* for the "Introduction to the Biological Sciences" in the curriculum of the "New Plan" at Chicago University. But one has the feeling that, in his desire to achieve simplicity and ease of understanding, he has violated certain pedagogical fundamentals, for there is a tendency toward loose definition and incomplete statement, leading in certain cases, if the reader is logical, to erroneous concepts. Then too, in an attempt to achieve reader-interest, he dwells much on the sociological parallels between plant-cell aggregates and human communities. To do this many passages in the text are so anthropomorphic that they cease to be truly biological and become mere teleological tautology.

The title, we feel, is a bit unfortunate, for it is not a "story of the plant kingdom," but rather an introduction to the study of plant morphology with a minimum of physiology thrown in for good measure, wherein it differs but little from too many of our so-called modern texts. We honestly wonder whether, in a story of the plant kingdom, Chapter IX on "Reproduction among Liverworts" is as important as one could be on fossil plants, which we failed to find.

Certain errors and slips have gotten into the text. Among them may be found a nearly correct description of the typical dichotomous venation of a fern followed by a reference to Figure 58 (& 59) which surely must be a species of *Cyrtomium,* for it has the atypical anastomosing venation of this genus. We also learn that the "American barberry" is responsible for the spread of "wheat rust". The American barberry (*Berberis canadensis*), while susceptible, is seldom found in the wheat-growing regions. The European barberry (*B. vulgaris*) is the "culprit."

We learn too that: "Among monocotyledons, only orchids and two other families . . . . have evolved to the condition of epigyny." As a matter of fact the number is somewhat larger, and if the more recent authorities are followed, twenty-one families are exclusively so with four additional ones containing some epigynous genera. While such errors in the end may not be important, they

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* Coulter, Merle C. The Story of the Plant Kingdom. 270 pages, illustrated mainly with drawings; indexed. University of Chicago Press, 1935. $2.50.

add nothing either to the dignity or the accuracy which can be expected in a text, no matter what age the student for whom it was designed.

W. H. Camp.

Flora of Graubünden

With a recently issued fourth part,‡ the Flora of Graubünden is brought to a conclusion. Neither descriptions nor analytical keys are provided, as these are available to students in other works. The distribution of each species is presented in its relation to soils, altitude, and plant associations, followed by citations of exact localities at great length. The whole work is marked by the accuracy, completeness, and thoroughness of the modern Swiss school.

H. A. Gleason.

Weeds of Switzerland

Since the days of prehistoric man, weeds have been an irritation to the agriculturist and at present they cause an annual loss measured by the millions of dollars. While the book before us† treats specifically of weed problems in Switzerland, many of its conclusions apply in America also. The kinds of weeds and the quantity of weed-growth in fields depends partly on the character of the soil, partly on the method of cultivation, but partly also on the kind of crop cultivated. Weed seeds are usually produced in large quantities and often retain the power of germination for many years. Actual destruction of weeds, this book points out, is only a temporary measure, and extermination depends on a thorough understanding of the behavior and life history of each kind.

H. A. Gleason.

A Study of Humus

As a review of the past studies of the black or brown spongy material of peats and of soils called humus, this thick volume* is interesting. From a present-day utilitarian standpoint, the book tells us more of what is not known than of what is. That humus nourishes micro-organisms and saprophytic plants, and that by their activities chemical nutrients from it are made available for higher plants, no one has ever seriously questioned. Forty-one pages are devoted to proving that we know really nothing about the chemistry of humus.

The composition of animal manures and vegetable composts and their decomposition constitutes an interesting chapter, though

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‡ Braun-Blanquet, J., and Rübel, Eduard. Flora von Graubünden. Part 4. Pages 1205-1695. Hans Huber, Bern. 1936. Swiss Fr. 22.50.

† Buchli, M. Oekologie der Ackerunkräuter der Nordostschweiz. 354 pages; 6 plates. Hans Huber, Bern. 1936. Swiss Fr. 9.80.

* Waksman, Selman A., Humus: Origin, Chemical Composition, and Importance in Nature. 494 pages; illustrated; indexed. Williams & Wilkins Company, Baltimore, 1936. $6.50.

relatively short, compared to the 190 pages devoted to discussions which are largely dismissed as irrelevant in the summaries.

The discussion of forest humus is meaty, and deals with both its physical and its chemical nature. The rapidly decomposing humus of a deciduous forest is contrasted with the more refractory coniferous forest humus. Similar contrasts are found in arable farm soils and in peats and in coal formation. Humus accumulations in water and particularly in sewage are also briefly discussed.

The last 180 pages of the book deal with recent developments in the study of humus, and of this the last 67 pages combine a very full bibliography.

Taken as a whole, the book is a reference work for the research worker and specialist, and for such contains much and full information.

FORMAN T. MCLEAN.

HUNDREDS OF ROSES IN COLOR

By long experience, untiring study, and the virtue of accumulating records that extend across the wide expanse of half a century, none is better fitted to produce a work on roses than is Dr. McFarland. This latest addition* to his many contributions on the Queen of Flowers is as unique in character as it is comprehensive in scope. Within a volume handsomely bound there is a veritable international court of the rose. The author has selected 500 of the world's roses—the contributions of the nations to our gardens. These are variously distributed over teas, hybrid teas, hybrid perpetuals, polyanthas, climbing and rambler roses and a few worthwhile species. While some of the pictures do dazzle the eye with the too-intense hues of catalog plates, almost 300 of these roses are reproduced fairly accurately in color. Each is described, the year of introduction is given, and the name of the introducer as well as comments on its merits are added, so that the book is at once a history, record, and guide in itself.

The majority of the roses illustrated are of comparatively recent introduction, and I have a feeling that a few more tried and true varieties of hybrid teas and hybrid perpetuals could have been used in place of some of the newer subjects that have not come up to expectations. However, the author has attempted to give a selection that is meant to suit a wide range of conditions and for this reason if for no other, his choice should be respected. The roses are treated alphabetically, there being no attempt at grouping types, until near the end of the book when three or four pages are devoted to classification.

P. J. MCKENNA.

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* McFarland, J. Horace. Roses of the World in Color. 296 pages, illustrated with photographs in half-tone and in color; indexed. Houghton Mifflin Co., Boston, 1936. $3.75.

THE NEW YORK BOTANICAL GARDEN

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

APRIL, 1937

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THE LIBRARY

Rich in historic volumes from the earliest days of printing, in works which are landmarks of scientific progress in later centuries, and similarly furnished with reports on the latest research, The New York Botanical Garden possesses, in 45,000 bound volumes, the country's largest library combining horticulture and botany.

Besides being virtually complete in that ultimate source of all botanists, the works of Linnaeus in their many editions, the Library also contains full sets of the world's leading periodicals on botany and horticulture. Every issue, for instance, of Curtis's Botanical Magazine from its inception in 1787, is on the shelves. The classic herbals of Hieronymus, Gesner, Fuchs, Dodoens, and others number nearly 300 volumes. The famous Cox collection of Darwiniana is also owned by the Botanical Garden.

Nearly all of the magnificent folio works of the elder Jacquin, including his rare American flora, which Andrew Carnegie presented at a cost of more than $1,000, are in the Botanical Garden's library. This remarkable work of the mid-eighteenth century, of which only 18 copies were ever published, contains 264 plates hand-drawn in color.

Gifts and purchases of other historic source books, which are essential to the scientist, have also combined to make this library an important study center. For research, especially in systematic botany, it rarely occurs that the required reference is lacking.

Based upon the botanical library of Columbia University, most of which was deposited here in 1901, the present library of the Garden aims to keep up to date by the addition of current publications on botany, horticulture, and related subjects. Though hampered in recent years because of lack of funds for the purchase and proper housing of many books desired, it continues to serve its users well. The collection has been developed primarily for the aid of members of the staff, students, and visiting botanists, but is placed also at the disposal of the public, who are free to consult its volumes in the reading room.

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OBSERVATIONS OF HARDINESS IN GHENT HYBRID AZALEAS AND THEIR ALLIES

Some years ago, while examining the Ghent and Mollis hybrid azaleas then growing on the grounds of the New York Botanical Garden, I became interested in the fact that certain of these shrubs were fifteen or twenty years old and fairly thrifty despite a common superstition that varieties such as these were short-lived, thriftless, and subject to "dwindling" or dying back when grown in this region. It had been well known to the importers of Dutch and Belgian azaleas that the Ghent hybrids and their allies seldom persisted for long in America and that thousands of these plants imported in former years had failed to endure.

Before discovering the age of the plants at the Botanical Garden, I had observed this "dwindling" process in the azalea collections of Long Island and New Jersey. Briefly described, one might say that a plant which had been at first in a thrifty condition would become checked in growth and occasionally the foliage would become pale. During subsequent winters the unthrifty branches would die back and the plant would become smaller from one year to the next until finally giving up its struggle for life. Although the summer growth was poor, actual death of the woody parts would occur during the winter. The natural inference, therefore, was that these varieties were winter-tender and that this characteristic was responsible for their failure to adapt themselves to American climatic conditions.

The finding of the older plants, in fair vigor, at the New York Botanical Garden led me to observe others. Specimens were found at various places in Massachusetts, at Rochester, N. Y., and at

other points in New York State where the weather was even colder. It was a pleasant surprise to find these reputedly tender shrubs, all apparently happy and vigorous, surviving the exceedingly cold winter temperatures of upstate New York and New England.

Putting together the facts concerning the azalea plants that were thrifty led to the observation that these successful ones were especially well supplied with moisture during the summer months. The best Ghent hybrids at the Botanical Garden at that time were those which had been planted in or near herbaceous borders which were being watered throughout the growing season. Those at Rochester were arranged so that the soil could be irrigated whenever the weather became very dry. At other places the soil was kept moist by a mulch of leaves which was maintained throughout the year. In still another instance the plants were growing on the banks of a stagnant pond where there was much atmospheric moisture due to frequent fogs and where the plants were protected from dry winds by a heavy wood. Inquiry of experienced azalea growers elicited the opinion that summer moisture conditions were perhaps involved in these successes.

Encouraged by these evidences of thrift and wishing to test the matter further, I undertook a trial planting of three varieties in 1930. In a particularly cold section of Broome County, New York, plants from Long Island which were already in the "dwindling" process were planted in a well drained bed composed of one part acid peatmoss and one part garden loam, prepared to a depth of eighteen inches. After planting in April, the bed was covered with a mulch of oak leaves eight inches deep. In November a frame covered with burlap was built around the bed and retained until the following April. Later results indicated that this burlap protection was not needed.

Some of the older unthrifty wood was lost the first winter, but as soon as the plants became well established they developed new stems from the base and entered upon a season of active growth which has been repeated every year since that time. During their six years in Broome County, these original plants have grown from mediocre examples of eighteen inches into broad, well proportioned shrubs of five and six feet, being covered every June with a wealth of bloom which fairly radiates glory. Every winter the temperature has dropped to at least twenty-five degrees below

zero, and in 1934 a record low temperature of —38° F. was reached with sub-zero temperatures nearly every day for some weeks. Although these temperatures have been cold enough to kill all the flower buds on the evergreen rhododendrons (such as *Rhododendron catawbiense* and *R. maximum*) which were growing in the same beds and have killed the torch azalea, *R. Kaempferi,* to the ground, the Ghent hybrids have bloomed abundantly

A branch of one of the Ghent hybrid azaleas which has proved its hardiness at The New York Botanical Garden.

every year. During one January a heavy snowfall broke down the burlap covering which was protecting the azalea bed, so that these plants had to finish the winter with no overhead protection whatever. The plants were quite unharmed and bloomed as usual in June, despite the fact that the mercury descended to thirty degrees below zero after all protection had been removed. While there is probably much difference between varieties in respect to winter hardiness, these results should at least establish a reputation for the hardiness of those which were tested, namely:

Coccinea Speciosa, Daviesii and Pucelle. It seems probable that a large number of other clonal varieties are equally hardy, since they have been found growing in cold regions. It would not be surprising to see a rather long list of hardy Ghent and Mollis azaleas assembled when additional sorts are grown and tested.

That the success of these plants was mainly due to favorable water relations during the growing season may be inferred from the evidence at hand, although such a conjecture needs confirmation by subsequent physiological study. During the rather serious drought conditions prevalent in the region for several summers, the soil in these azalea beds was always cool and moist, without sogginess but well aerated and never unduly dry. If one were to plunge his hand into the soil beneath the leafy mulch on a hot dry day, the peaty soil would feel soft and about as moist as a damp sponge. This uniformity of moisture supply is a factor which undoubtedly kept the plants in a steady condition of vegetative vigor and prevented the checks in growth which are known to result from alternate periods of dryness and wetness. Further, it seems likely that this good growth in summer promoted the hardiness of the plants during each subsequent winter. It is a common observation of fruit growers and other growers of woody plants, supported by scientific evidence, that thriftless or inactive branches are more susceptible to winter injury than are the more vigorous portions of the tree or shrub. It is evident that all azaleas are sensitive to drought and that the combined heat and dryness of American summers is trying even to the native species, such as *Rhododendron calendulaceum, R. roseum, R. Vaseyi* and *R. atlanticum.* All of these species did better when grown under a heavy summer mulch than when grown without it. That grafted azaleas are even more sensitive to inadequate moisture conditions than are seedlings and own-root sorts will be brought out later. Altogether, the inference is clear that summer water relations play an important role in the thrift of the azaleas, and that this thrift, in turn, contributes substantially to the plants' ability to resist winter cold. And there are additional implications, also, from these purely horticultural observations.

After these encouraging results, further experiments were undertaken. Plants of a dozen different varieties of Ghent and Mollis azaleas were secured from a commercial planting where trouble had been experienced in making the young plants develop

vigorously. Planted in April, as before, in peat beds mulched with oak leaves, the young plants grew normally until mid-June when dry weather commenced. Although the soil was adequately moist, the atmosphere was very dry and the young plants began to suffer coincidentally with this. Growth was checked, and the younger leaves failed to develop a normal green color, being pale, chlorotic and often somewhat mottled as if infected with a virus disease of the "mosaic" type. Other symptoms were small size of the new leaves, partial distortion of the leaves and reduced length of new stems. Such symptoms have been commonly attributed to rhododendron mosaic or azalea yellow-leaf, under which names several incompletely known troubles appear to have been listed.

While these virus-like symptoms appeared in the upper parts of the scion, they did not occur in the stems and foliage of the rootstock which had been permitted to grow out from the bases of certain plants. The foliage on these rootstock branches remained green and healthy throughout the time chlorosis was appearing on the leaves of the scions. The rootstock was of uncertain origin, but was presumed to have been derived from mixed seedlings of the Pontic azalea, *R. luteum*. There was no transfer of the symptoms from the scion to the rootstock.

In August, after copious rains had restored the atmospheric and soil moisture, the azaleas immediately became active, vegetative growth started, and normal green leaves developed. No further sign of chlorosis appeared throughout the remainder of the season.

Although no pathological studies have yet been made of this material to determine whether a virus disease is actually present, these preliminary observations strongly indicate that the cause of the chlorosis and reduced vigor of the grafted azalea plants is merely an unfavorable graft union and not a pathogenic infection. As noted above, these azaleas appear very sensitive to conditions of restricted water supply. If stock and scion do not form a thoroughly functional union, it is a reasonable conjecture that the movement of water from roots to top may be inadequate to provide a sufficient supply to the scion at times when the air is dry and large quantities of moisture are being lost from the leaves. Thus injury might occur in times of atmospheric dryness which would not occur during the more humid seasons, since, in the latter, an imperfectly functioning graft union would still be good enough to transfer sufficient water from stock to scion.

Since the Ghent and Mollis hybrids do not root easily from cuttings, grafting is the common commercial practice for propagation. Yet, to avoid troubles such as those here cited, own-root plants would be preferred to grafted plants. The use of auxins, or growth-promoting chemicals, as developed at the Boyce Thompson Institute, offers a promising future for the production of own-root hybrid azaleas.

Certain other practical considerations should be noted. Although these azaleas need adequate summer moisture, they quickly resent a soil that is saturated with water and always require good drainage. In these experiments, azaleas planted on well drained land underlain by gravel grew twice as well as those planted in poorly drained soil underlain by stiff clay, although the surface soil in the peat beds was practically the same in both cases. Plantings of all azaleas and most rhododendrons on the poorly drained soil are doing badly. For best results the soil should be porous and well aerated, but fibrous and retentive of moisture in the sense of being spongy.

Atmospheric dryness is probably very bad for the Ghent and Mollis azaleas, as it is indeed for the other members of the genus, even when abundant soil moisture is present. There are certain sites, such as dry southern exposures or open plains that are swept with hot winds in summer, where Ghent azaleas and their allies could not be expected to thrive no matter how carefully they were irrigated or mulched.

It should also be noted that all Ghent and Mollis azaleas are certainly not of equal hardiness. Several different species, some of them tender like *Rhododendron occidentale, R. luteum* and *R. speciosum,* are present in the hybrid mixture and their characteristics occasionally segregate out in the progeny. On the other hand, several varieties are supposed to be of superior hardiness. Pending further trials, it would not be safe to make definite recommendations at this time.

If ultimately a fair-sized list of Ghent and Mollis azaleas, which with their wide range of color are among the showiest of all flowering shrubs, should prove hardy in the region of the northeastern states after they have been tested under good summer conditions, and if new propagating methods make the production of own-root plants easy and desirable, then we may look forward to a renewed interest in these truly gorgeous shrubs and a new supply of fine things for our gardens.

CLEMENT G. BOWERS.

STEPHEN G. CUTTING CHOSEN FOR YEAR AT KEW

Stephen G. Cutting has been selected as this year's candidate to study at the Royal Botanic Gardens at Kew, England, while Frank G. Mackaness will come as a student gardener from Kew to The New York Botanical Garden.

Mr. Cutting, who has served at the Garden for more than two years and who last spring received his certificate for completing studies in the Course for Professional Gardeners, took part in the Garden's Rocky Mountain expedition last summer. He recently received a prize of a copy of Britton & Brown's Illustrated Flora for having made the year's finest herbarium collection of native plants. His selection for the year abroad was made by a committee from the National Association of Gardeners, who interviewed five students from the Botanical Garden. He will leave New York at the end of June, when Howard Swift, the first exchange student gardener to be sent from The New York Botanical Garden, will return from England to resume his work here. The National Association of Gardeners is providing the traveling expenses of this year's student from America.

C. J. Collins, the 1936 exchange student from Kew, will leave The New York Botanical Garden this month and return to England after a trip to the Pacific coast.

LORD ABERCONWAY VISITS THE GARDEN

While in America to attend the spring flower shows in Boston, Philadelphia, and New York, Lord Aberconway, President of the Royal Horticultural Society, and one of Great Britain's outstanding authorities on gardening, spent the afternoon of Sunday, March 21, at The New York Botanical Garden. Accompanied by Dr. H. A. Gleason, Mr. H. de la Montagne, Mr. T. H. Everett, and Dr. E. D. Merrill, the latter representing the Board of Managers, Lord Aberconway inspected many features of the grounds, but indicated especial interest in the Thompson Memorial Rock Garden. Himself the owner of one of the finest gardens in Great Britain, where he has large collections of gentians, primulas, and rhododendrons, he declared at the conclusion of his visit that he was impressed with the generally high standard of cultivation both in the greenhouses and on the grounds at The New York Botanical Garden.

REPORT OF THE DEPUTY DIRECTOR FOR 1936

The year just closed at The New York Botanical Garden has been saddened by the death of its director on December 24, after thirty-five years of honorable and productive service. For more than thirty years he was my professor, my colleague, my director, and always my friend. I need say no more.

Construction and Maintenance

The general work of maintenance and repair has proceeded as usual, subject to the customary limitations caused by insufficient labor.

The chief feature has been the completion of certain construction projects under the direction of the Department of Parks with the assistance of labor from the Works Progress Administration. The new steam tunnel from the Power House to the Museum is in operation and will probably effect a saving in coal. The new garage is in use and is a great convenience. Much of our path system has been resurfaced. Weather-stripping has been placed on all windows in the Museum. Additional stone wall, 285 feet in length, was built near the Rock Garden and the retaining wall along the Bronx River was extended 500 feet. Stone piers were made for the Perennial Border and the work of lowering the path is under way. Numerous new benches for the grounds have been installed.

Two units of Conservatory Range 2 and one unit of the Propagating House were thoroughly repaired and renovated. New steam pipes were installed in two units of Conservatory Range 1. The waterlily tanks have been freshly waterproofed. The roof of the Propagating House has been repaired.

Essential preliminaries have postponed the repairs to Conservatory Range 1, for which the City made an appropriation in 1935. At present specifications are in the hands of contractors, bids will be opened this month, and we have hopes that the work will be completed before the beginning of next winter. The appropriation was planned to cover about half of the whole range of glass. Application has been made to the City for an equal sum of money on the Capital Outlay Budget of 1937 to complete the work.

In the Hemlock Forest, 800 more young hemlocks have been planted, bringing the total to nearly 3,000. More than half a mile of paths have been resurfaced. Special attention has been

given to the trees of the rest of the grounds. A program of tree-feeding and mulching has been adopted and much necessary trimming and pruning has been done. Construction has been completed at the north end of the Rock Garden. The Rock Garden fence has been extended to enclose about three more acres to the south.

Horticultural Operations

The reorganization of the gardening force, which has been in progress during the past four years, is virtually completed and we now have an efficient personnel. Further improvements in efficiency will be minor in character, and as a consequence additional gardening activities can be undertaken only by an increased force of gardeners, the elimination of features now maintained, or a reduction in the standard of cultivation.

Mr. Henry Teuscher, dendrologist, resigned in May. His work was absorbed by the Horticulturist, and Joseph Tansey, a graduate of Cornell and a former student gardener, was appointed foreman gardener in charge of nurseries and propagation.

During 1936 our living plant collections were considerably increased by gift, exchange and purchase. Notable gifts include 3,000 roses in 110 varieties from Bobbink & Atkins, a large assortment of Mexican plants from Mr. T. MacDougall, many items of interest from Mr. Stanley G. Ranger, a collection of shrubs from the Boyce Thompson Institute, and a collection of rock garden and greenhouse material from the Royal Botanic Gardens, Kew. Thanks are due to many commercial dealers who have generously donated bulbs and other forcing stock for use in our greenhouse displays.

The flower displays throughout the year have been of high quality, particularly the annuals, roses, waterlilies, hardy asters, and dahlias, the rock garden, and the greenhouse exhibits. Early frosts cut short a promising outdoor chrysanthemum show. The display houses in Conservatory Range 1 continued to prove a great attraction to the public and during the season some 7,000 pots of plants, representing 571 species and varieties, were exhibited. A plant of *Victoria Cruziana* in the aquatic house has also proved of great interest to visitors.

The collection of ferns, begonias, and bulbous material in Conservatory Range 2 is in excellent condition, while the standard of cultivation of other plants is commendably high. The orchids

have improved greatly and would undoubtedly be still better if appropriate benches were provided.

The number of plants grown in the display gardens of annuals, chrysanthemums, cannas, and other so-called bedding plants has been about 36,000. An innovation here was a greatly extended planting of hardy asters, numbering 3,000 plants in forty varieties. The new iris garden west of Conservatory Range I has been planted with more than 6,000 plants in 181 varieties. The tubs in the tropical waterlily tank have been replaced by new ones of larger size.

In the Rose Garden much work has been accomplished. Beds have been deeply dug and manured and 27 new varieties of climbing roses have been planted. The long border of Polyantha roses has been trenched, fertilized, and partly replanted.

In the Perennial Border supported by the Advisory Council, a quarter of the plants were lifted and replanted according to plan after the ground was thoroughly trenched and fertilized.

Planting of the Rock Garden has been continued and is now nearing completion, except the bog area at the south end and the heather area at the north. Many thousands of plants have been raised for this purpose and some 7,000 heathers are now available for further planting.

During the fall more than 1,000 trees and shrubs in 261 varieties were transplanted from the nurseries into the permanent collections.

During the year two distributions of surplus plant material to members of the Garden were arranged, during which more than 8,000 plants of iris and several thousand of fuchsia and verbena were disposed of. Schools in New York City have also received surplus material. In our seed exchange, 3,422 packets were distributed to botanical gardens and 2,471 packets were received from them. Our present seed-list offers 618 items for exchange during the present winter.

An expedition consisting of T. H. Everett, Horticulturist, and E. J. Alexander, Assistant Curator, and two student gardeners was sent to the Rocky Mountains to collect seeds of plants likely to be of value in rock gardens. The expenses of the trip were met by contributions from 44 subscribers in the United States, Canada, and six European countries. In the field three months, the party collected seeds of 138 species of plants for rock gardens, many

of them hitherto unknown in cultivation and all of them promising material. These are being shared among the subscribers and also grown in our own Rock Garden.

At the last International Flower Show, the Garden was awarded a special gold medal for an exhibit of a group of plants originating in the Mediterranean Region.

Control of Pests and Diseases

Our pathologist, Dr. B. O. Dodge, has actively continued the use of standard control measures against fungous diseases and insect pests and as a result our growing plants, both outdoors and under glass, have been in uniformly good condition.

The annual execution of a well-planned program of spraying during the past few years has led to the almost complete extermination of cherry scale, tussock moth, tent caterpillar, bagworm, and catalpa mealy bug. On the other hand, aphids and lace bugs have been unusually troublesome. Our Rose Garden, which has been remarkably free from disease, has been kept so by no less than 47 treatments.

Our own survey, which agrees with that made by the Dutch Elm Disease Laboratory, has disclosed no new case of the disease on our grounds and we believe that we are in no immediate danger of losing our elms.

We have continued to coöperate with the State Conservation Commission in the control of the gypsy moth. Spraying, tree-banding, and destruction of egg masses have been so thoroughly done by state workers that we shall probably not be troubled by this dangerous pest for some time to come.

The Japanese beetle increased somewhat in numbers during 1936, but with a corresponding increase in our control measures we have avoided serious damage. Experiments are under way on the use of derris dust as a repellent. About two and a half acres of lawn have been treated with lead arsenate. By trapping and hand-picking no less than 444,000 adult beetles have been collected and destroyed.

Soil sterilization has proved very effective for the control of nematodes and various injurious soil fungi. Its use will be continued and extended.

Herbarium

The herbarium continues the rapid growth which during the short span of forty years has made it one of the leading herbaria

of the world. During the year 41,277 specimens have been mounted, labeled, and incorporated, bringing the total to 1,868,372.

The sources of these plants and their respective numbers, in round figures, are 5,000 by gift or collection, 9,000 by purchase, 18,000 by exchange, 4,000 previously on hand, and the balance miscellaneous.

As reported a year ago, the cases for the housing of this vast collection are full. To care for current accumulations, 2,000 more boxes of corrugated paper were purchased, making more than 5,000 now in use. About 400,000 specimens, estimated conservatively, are now stored in this temporary fashion. The specimens are difficult to consult, the boxes are of short duration and constitute a distinct fire hazard. The replacement of these boxes and the old-fashioned wooden cases by new steel equipment is an urgent necessity. The continued growth of the herbarium has also exhausted all available floor space under our present arrangements.

During the year the herbarium has sent out 22,000 specimens in exchange, giving us a handsome credit balance from which we may expect a constant influx of valuable material from all parts of the world.

The herbarium staff has actively continued research in systematic botany, based on these valuable collections. Dr. Howe, in the little time left free by administrative duties and illness, was occupied by his work on seaweeds. Dr. H. A. Gleason has prosecuted his study of tropical American plants. Dr. John K. Small is rounding out his many years of research by the preparation of seven books on the plants of the United States. Dr. F. J. Seaver, Mr. Percy Wilson, and Mr. R. S. Williams have continued their work with fungi, West Indian plants, and mosses, respectively. Dr. A. C. Smith has completed a comprehensive study of the sarsaparilla family, for publication in North American Flora and is engaged on a similar monograph of the American nutmegs. Dr. H. N. Moldenke returned in November from a year's leave of absence in Europe as a fellow of the National Research Council and is now preparing a monograph of the North American pipeworts. Dr. W. H. Camp has continued his study of the American blueberries. He spent two months in the Alleghany Mountains and is now in southern Mexico for study of these plants in the field. Mr. Alexander has been primarily responsible

for the correct identification of the growing plants in our greenhouses and on our grounds. As custodian of the herbarium, with the assistance of a staff of W.P.A. employees, Mr. G. L. Wittrock has kept the collection continuously in excellent condition.

The use of the herbarium is by no means limited to our own staff. During the year, based upon our collection, plants have been identified for outside parties to the extent of several thousand, a score or more professional botanists have worked in the herbarium for various periods of time, and no less than 16,480 specimens have been sent out on loan to most of the principal herbaria of the world, there to serve as a basis for research for numerous eminent botanists. The good and still growing reputation of the herbarium staff is still further evidenced by the number of specimens sent in from other institutions with requests for an expression of our opinion. These include such well-known botanical centers as Kew, Stockholm, Harvard, the National Herbarium, the Field Museum, and many others.

Laboratories

Research in our laboratories, by Dr. A. B. Stout and Dr. B. O. Dodge, and under their direction, has been facilitated by the purchase of some new optical equipment.

Dr. Stout, assisted by Miss Clyde Chandler of our regular staff and by a varying number of W.P.A. employees, has continued his manifold studies on plant breeding and on sterilities in plants. These have involved extensive research with lily, lobelia, petunia, lily-of-the-valley and iris, as well as his better known experiments with seedless grapes and daylily. His studies of grapes were interrupted by a late spring frost, but some of his seedless varieties have borne fruit for the first time. A bulletin describing the progress and results of his work was published by the New York State Agricultural Experiment Station.

Further advances have been made in the breeding of daylilies. The marvelous improvements which Dr. Stout has made in these old-fashioned flowers have drawn much attention and have resulted in a great popular interest in their cultivation. His studies, however, are not solely horticultural. The development of his new improved varieties is largely incidental to his botanical research into the taxonomy, cytology, and reproductive behavior of the plants.

The research time of Dr. Dodge is still given to a cyto-genetic study of the pink bread-mold, in which he has made numerous discoveries of great scientific importance. These studies are based primarily on the sexual stage of the plant, while most genetic research is based on the non-sexual generation. During the year Dr. Dodge published five articles presenting the results of his investigations.

Photography

The work of photography has occupied the full time of our staff photographer and of 15 to 30 hours per week of an assistant from the Works Progress Administration. Nearly 1,300 negatives and more than 4,000 prints have been made, as a record of the research work and the horticultural activities of the Garden, and of these many have been used for publication. More than 500 lantern slides, most of them colored, have been made to illustrate the numerous lectures given by members of the staff.

Library

Because of reduction in available funds, the growth of the library has been less than usual. The number of bound volumes has been increased by only 332, bringing the total content of the library to 45,066 volumes.

Recommendations for the purchase of books have for the first time been entrusted to a library committee. This committee has also considered the periodicals received and has eliminated a number which are of little use to the work now in progress. Notwithstanding this reduction in both books and journals, the library continues to be adequate for our purposes.

It will soon be necessary to choose whether our library is to be a general and comprehensive collection of works dealing with all phases of botany and horticulture, or whether it shall be limited generally to our own specific needs. Continued restriction of funds will obviously compel us to choose the latter, while the former will require much larger appropriations.

For many years the library has been too large for its own quarters and book-shelves have filled half or more of the space in three other rooms, all of which are needed for other purposes. Consideration should be given to double-decking the present stack-room, thereby doubling its shelf space and releasing the other rooms. The cases for our card catalogs are also filled and need to be extended.

Publications

Twelve issues of the *Journal* with 307 pages have been published as usual, under the editorship of Miss Carol H. Woodward.

Two numbers of *Addisonia* have been edited by Mr. E. J. Alexander. The high quality of the plates and letterpress has been maintained. Numerous paintings for future use have been made by Miss Margaret Sorensen.

In *Brittonia,* three numbers with 264 pages have been published under the editorship of Dr. A. C. Smith. This highly technical magazine is now used chiefly for exchange. Sufficient manuscript is easily available to complete a volume each year, if funds should be found.

The usual six numbers of *Mycologia* have been published, containing 633 pages. Under the management and editorship of Dr. F. J. Seaver, this magazine continues to hold its high reputation. It has a good subscription list and is one of the few botanical magazines which are financially self-supporting.

No parts of *North American Flora* were issued in 1936, but three manuscripts are now being edited for publication in 1937. Effort has been made to encourage the research necessary to the preparation of this work and it seems probable that future publication will go on much more rapidly than in the past.

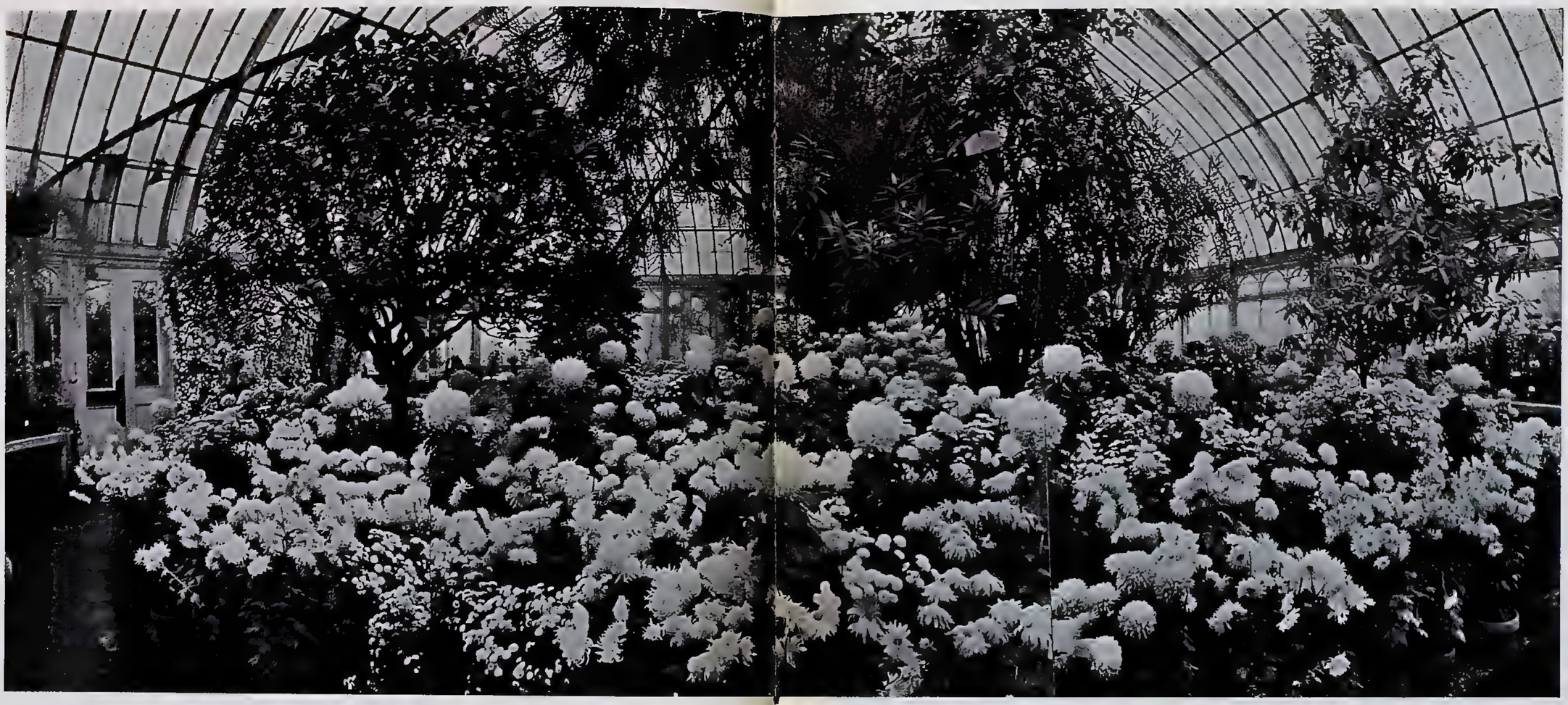
Sales of other books published by the Garden, and written by Rydberg, Gleason, and Britton continue at a normal rate.

The copyright of Britton & Brown, Illustrated Flora of the Northern States and Canada, is now in the possession of the Garden and Mrs. Addison Brown, jointly. With the coöperation of Mrs. Brown, a reprint of the second edition appeared early in 1936 and has enjoyed a very encouraging sale.

Education and Lectures

The course for professional gardeners has been continued and has now completed the first half of its fifth year. In order to lighten the burden of instruction, which is given in the evening and in addition to regular work, only the second year is now being presented, while in the season of 1937-38 only the first year will be offered. Twenty-one students were graduated and received certificates last April and 34 are now enrolled.

Practical training in gardening for a limited number of young men with previous experience has been very successful. From a considerable number of applicants we have always been able to



A typical exhibit in one of the special display houses in Conservatory Range No. 1—chrysanthemums as they were seen by thousands of visitors last November.

select excellent men. They have proved themselves useful to us and are themselves very well satisfied with the training they receive and with the opportunities for outside study which are available in our library, herbarium, and plantations.

One of our student gardeners was sent last April to England for a year of practical experience in the Royal Botanic Gardens at Kew and a Kew student is working with us in exchange. The transportation expenses of both were met by the English Speaking Union, to which we are deeply grateful. Arrangements are under way for a second exchange during 1937-38.

Extension courses of instruction in gardening, a course on native ferns, and a course on trees and shrubs have been offered by Dr. McLean.

During the year 35 public lectures, illustrated by lantern slides, have been given on Saturday afternoons in the Museum Building. Four-fifths of these were given by members of the Garden staff.

Classes from the public schools have visited the Garden in the usual number. Many other students, especially from Fordham University and Hunter College, have visited the Garden independently to secure information required in their class work.

During the year 82 lectures have been given by members of our staff to garden clubs and similar organizations. The Garden has also coöperated in the programs of the Radio Garden Club over Station WOR, taking charge of one program each month.

Hundreds of requests for information have been received from individuals, schools, periodicals, industrial firms, and governmental

agencies, coming from every continent and covering a wide range of subjects. All of these have received attention to the best of our ability.

As usual, our library has been freely consulted by visitors, most of whom seek information on some one definite subject.

Membership

The number of annual members has remained essentially unchanged. The administration hopes that an increase will soon be noted. To that end, numerous plans have been considered but so far only one has been adopted. Beginning with the next issue, our illustrated magazine *Addisonia* will be sent to every member. The distribution of growing plants to members will also be continued, since it has aroused much favorable comment in the past.

Pensions

Year by year more of the Garden employees reach an age or a state of health which makes it inadvisable to continue them longer in active service. Each of these cases has been considered in turn, and to some of them the Board of Managers has granted a retiring allowance. An examination of our books shows that six men are now on pension and that two more will be after May first. The annual cost to the Garden for these is a trifle more than $6,000.

The widespread development of pension systems, both public and private, the general expectation of a retiring allowance now held by employees in all industries, and the precedent already established by the Garden in eight cases, compel us at least to consider some system of pensions for all members of the Garden staff. In the meantime, until some definite policy is adopted, we must boldly face the fact that a dozen or more employees, several at high salaries, will soon reach a retiring age or condition.

Personal Honors

Your director, Dr. M. A. Howe, served through the year as president of the Torrey Botanical Club and received the gold medal of the American Dahlia Society. Shortly before his death he was elected president of the Botanical Society of America.

The deputy director was vice-president of the Botanical Society of America, vice-president of the Torrey Botanical Club, and a member of the National Research Council. For 1937 he has been elected president of the American Society of Plant Taxonomists.

Dr. F. T. McLean has been president of the New York Bird and Tree Club and president of the Metropolitan Gladiolus Society.

Dr. B. O. Dodge has served on the council of the Mycological Society of America and as associate editor for the Botanical Society of America.

Dr. F. J. Seaver has been editor for the Mycological Society of America and a member of the council of the American Association for the Advancement of Science.

Mr. T. H. Everett has been a director of the American Rock Garden Society and vice-president of the American Amaryllis Society.

Dr. A. B. Stout has been chairman of the committee on daylilies for the American Amaryllis Society.

Works Progress Administration

As in previous years, the Garden has enjoyed the services of many workers from the Works Progress Administration. Some of these have served us for several years consecutively and have become skilled in various phases of the routine work of the Garden. They have assisted in many forms of research, sometimes in a highly technical capacity; they have mounted herbarium specimens and incorporated them into our collections; they have done much typing of manuscript and have copied thousands of original descriptions of plants, often in a foreign language. They have served as book-binders, typists, stenographers, elevator operators, watchmen and guards, clean-up men, photographers, artists, statisticians, gardeners and laborers. In fact, excepting only our business office, there is no department of the Garden in which they have not served and been of distinct and valuable use to us.

We do not know, of course, how long or to what extent we shall continue to profit by the collaboration of the Works Progress Administration, but we are assured that there is no immediate prospect that the service will cease.

In addition to labor, we have also received large quantities of supplies, particularly stationery, artists' materials and herbarium supplies.

We are deeply grateful to the Works Progress Administration for the assistance, both material and personal, which has been given us, and which has enabled us to undertake successfully numerous lines of work which would otherwise have been impossible.

H. A. Gleason.

REPORT OF THE TREASURER FOR 1936

JOHN L. MERRILL, Treasurer

EXHIBIT I

BALANCE SHEET

December 31, 1936

Assets

Permanent Fund Assets:			
Investments at cost or appraisal at time of acquisition (Exhibit III)		$2,550,402.11	
Cash awaiting investment		45,703.08	
			$2,596,105.19
Current and Working Assets:			
Cash in banks and on hand:			
For general purposes	$ 12,108.45		
For special purposes	4,741.28		
		$ 16,849.73	
Accounts receivable — city maintenance		15,901.82	
Interest and dividends receivable (Exhibit III)		24,435.62	
Prepaid insurance premiums, etc...		2,432.66	
			59,619.83
			$2,655,725.02

To the Board of Managers of

The New York Botanical Garden:

We have made an examination of the balance sheet of The New York Botanical Garden as at December 31, 1936, and of the statement of operations for the year 1936. In connection therewith, we examined or tested accounting records of the Garden and other supporting evidence and obtained information and explanations from officers and employees of the corporation; we also made a general review of the accounting methods and of the income

EXHIBIT I

BALANCE SHEET

December 31, 1936

LIABILITIES

Permanent Funds (Exhibit IV):			
Restricted endowments		$ 251,242.30	
Unrestricted endowments, including bequests set aside by the Board of Managers as permanent funds		2,323,704.07	
Special endowment with life interest in respect of income therefrom..		21,158.82	
			$2,596,105.19
Current Liabilities and Special Funds:			
Current liabilities:			
Accounts payable		$ 8,197.47	
Special funds (Exhibit V):			
Unexpended income from restricted funds	$ 2,775.34		
Unexpended contributions set aside by the Board of Managers for specific purposes....	1,965.94		
		4,741.28	
Deferred income credits:			
Membership dues paid in advance	$ 130.00		
Subscriptions and fees paid in advance	1,415.85		
		1,545.85	
Working fund:			
Balance at December 31, 1935...	$ 45,135.23		
Add—Excess of unrestricted income over expenditures for the year ending December 31, 1936 (Exhibit II)	29,320.27		
	$ 74,455.50		
Deduct—Transferred to Special Endowment Fund in accordance with resolution of the Board of Managers	29,320.27	45,135.23	
			59,619.83
			$2,655,725.02

and expense accounts for the year, but we did not make a detailed audit of the transactions.

In our opinion, based upon such examination, the attached balance sheet (Exhibit I) and related statements (Exhibits II to V, inclusive) fairly present the position of The New York Botanical Garden at December 31, 1936, and the result of its transactions for the year.

PRICE, WATERHOUSE & Co.

56 Pine Street, New York, April 5, 1937.

EXHIBIT II

Statement of Operations for the Year Ending December 31, 1936

		Total	Restricted and special funds	Unrestricted
Income:				
Income from investments of permanent funds		$129,296.69	$ 10,840.00	$118,456.69
Contributions:				
City maintenance		211,365.06		211,365.06
Other		3,209.20	2,734.20	475.00
Membership dues:				
Annual		8,960.00		8,960.00
Sustaining and fellowship		2,090.00		2,090.00
Sales of duplicate books and sundries		2,520.28	466.45	2,053.83
Subscriptions and sales of publications		9,507.16	6,580.53	2,926.63
Total income		$366,948.39	$ 20,621.18	$346,327.21
Expenses:				
Horticulture:				
Salaries	$55,162.70			
Plants, seeds, supplies, etc.	5,429.65			
		$ 60,592.35	$ 1,912.43	$ 58,679.92
Science and curating:				
Salaries	$49,896.92			
Specimens, supplies, etc.	6,549.71			
		56,446.63	5,329.23	51,117.40
Library:				
Salaries	$ 7,784.61			
New books, periodicals, etc.	2,371.42			
		10,156.03	2,388.09	7,767.94
Education:				
Salaries	$ 8,804.40			
Instruction, lectures, etc.	2,930.74			
		11,735.14	1,216.39	10,518.75
Publications:				
Printing, mailing, etc.		12,223.44	8,973.85	3,249.59
Administration:				
Salaries	$29,262.89			
Stationery, telephone, postage, etc.	10,331.55			
		39,594.44		39,594.44
Care and up-keep—Grounds:				
Salaries	$34,699.59			
Wages	25,915.59			
Supplies, etc.	4,852.91			
		65,468.09	25.00	65,443.09
Care and up-keep—Buildings:				
Salaries	$49,094.93			
Fuel, light, power, etc.	29,379.43			
		78,474.36		78,474.36
Improvements and equipment purchases		2,161.45		2,161.45
Totals:				
Salaries	$234,706.04			
Wages	25,915.59			
Other expenses	76,230.30			
		$336,851.93	$ 19,844.99	$317,006.94
Excess of income for the year		$ 30,096.46	$ 776.19	$ 29,320.27

EXHIBIT III

Summary of Investments, December 31, 1936

	Par value (no par value stocks at book value)	Approximate quoted value	Book value, representing cost or appraisal at time of acquisition	Accrued interest and dividends December 31, 1936	Average yield per year on basis of	
					Quoted value	Book value
					%	%
General funds:						
Bonds	$ 513,800.00	$ 560,080.43	$ 523,096.87	$ 4,529.37	4.06	4.34
Stocks:						
Preferred ..	144,505.00	181,746.88	159,962.50	1,225.00	4.70	5.34
Common ...	28,923.80	15,082.00	28,923.80		2.65	1.38
	$ 687,228.80	$ 756,909.31	$ 711,983.17	$ 5,754.37	4.18	4.45
Sage fund:						
Bonds	$ 486,000.00	$ 528,536.25	$ 448,798.75	$ 5,903.32	3.61	4.26
Stocks:						
Preferred ..	208,730.34	260,690.63	219,677.85	1,637.50	4.42	5.25
Common ...	101,195.00	204,127.50	133,113.04	1,750.00	4.21	6.46
	$ 795,925.34	$ 993,354.38	$ 801,589.64	$ 9,290.82	3.95	4.89
Special endowment fund:						
Bonds	$ 141,000.00	$ 153,996.25	$ 141,317.25	$ 2,274.15	3.85	4.20
Stocks:						
Preferred ..	281,437.50	402,418.75	337,656.88	2,537.50	4.42	5.27
Common ...	19,000.00	36,371.25	46,245.16	300.00	3.30	2.59
	$ 441,437.50	$ 592,786.25	$ 525,219.29	$ 5,111.65	4.21	4.75
John D. Rockefeller, Jr., fund:						
Bonds	$ 245,000.00	$ 279,214.50	$ 247,913.55	$ 2,285.03	3.65	4.11
Preferred stocks	214,137.50	306,618.75	247,325.01	1,993.75	4.37	5.42
	$ 459,137.50	$ 585,833.25	$ 495,238.56	$ 4,278.78	4.03	4.76
Special trust fund:						
Common stock	$ 16,371.45	$ 8,496.00	$ 16,371.45			
	$2,400,100.59	$2,937,379.19	$2,550,402.11	$24,435.62	4.07	4.68

INVESTMENTS

Summary of Average Yields for Year

	On basis of Quoted value	On basis of Book value
	%	%
Bonds	3.81	4.26
Stocks:		
Preferred	4.45	5.32
Common	3.86	4.54
	4.07	4.68

EXHIBIT IV

Statement of Permanent Funds Showing Changes During the Year Ending December 31, 1936

	Balance January 1, 1936	Additions and *Deductions**	Balance December 31, 1936
Restricted endowments:			
Endowment for science and education	$ 89,115.49		$ 89,115.49
Addison Brown Fund	21,149.31		21,149.31
John Innes Kane Fund	35,347.63		35,347.63
Maria De Witt Jesup Fund	25,000.00		25,000.00
Olivia E. and Caroline Phelps Stokes Fund	5,030.63		5,030.63
Charles Budd Robinson Fund	755.04		755.04
The H. H. Memorial Fund	5,000.00		5,000.00
Alexander P. Anderson and Lydia Anderson Research and Fellowship Fund	10,000.00		10,000.00
Students' Research Fund	10,162.00	$ 175.00	10,337.00
Endowment for the publication of "Mycologia"	2,000.00	2,500.00	4,500.00
Nathaniel Lord Britton and Elizabeth Gertrude Britton Fund	24,440.00	20,567.20	45,007.20
	$ 228,000.10	$23,242.20	$ 251,242.30
Unrestricted endowments:			
Endowment Fund	$ 241,692.18	$26,529.66	$ 268,221.84
David Lydig Fund	34,337.86		34,337.86
William R. Sands Fund	10,000.00		10,000.00
Darius Ogden Mills Fund	48,099.17		48,099.17
Henry Iden Fund	10,000.00		10,000.00
Fanny Bridgham Fund	30,000.00		30,000.00
Francis Lynde Stetson Fund	25,000.00		25,000.00
Russell Sage and Margaret Olivia Sage Memorial Fund	787,967.95	14,839.88	802,807.83
Frances Griscom Parsons Fund	2,304.67		2,304.67
Special Endowment Fund	527,445.99	25,198.87	552,644.86
The John D. Rockefeller, Jr., Fund	505,964.00	*—1,062.50*	504,901.50
The Charles Patrick Daly and Maria Lydig Daly Fund	19,636.34		19,636.34
The James A. Scrymser and Mary C. Scrymser Fund	12,750.00		12,750.00
The George N. Best Fund	3,000.00		3,000.00
	$2,258,198.16	$65,505.91	$2,323,704.07
Special endowment:			
Special Trust Fund	$ 21,158.82		$ 21,158.82
	$2,507,357.08	$88,748.11	$2,596,105.19

* Indicated by minus sign (—).

EXHIBIT V

Special Funds

Statement of Application of Income from Restricted Permanent Funds and Special Funds Designated for Specific Purposes

	Balance January 1, 1936	Additions	Expenditures and transfers	Balance December 31, 1936
Restricted permanent funds:				
Endowment for science and education:				
Public lectures and instruction, research and publications other than "Addisonia"	$ 1,262.87	$ 3,875.30	$ 5,138.17	
Addison Brown Fund:				
Publication of "Addisonia"	114.16	1,759.45	1,873.61	
John Innes Kane Fund:				
Plant purchases and expenses	1,621.43	1,537.10	1,691.14	$ 1,467.39
Maria De Witt Jesup Fund:				
Botanical collections and binding of books	262.72	1,087.25	1,219.05	130.92
Olivia E. and Caroline Phelps Stokes Fund:				
Investigation and preservation of native plants	45.96	218.95	264.91	
Charles Budd Robinson Fund:				
Exploration		32.50	32.50	
The H. H. Memorial Fund:				
Development of model gardens	3.39	217.90	221.29	
Alexander P. Anderson and Lydia Anderson Research and Fellowship Fund:				
Research	616.90	434.70	300.00	751.60
Students' Research Fund:				
Scholarships and prizes	94.81	449.90	500.00	44.71
Mycologia Fund:				
Publication of "Mycologia"	494.07	5,849.78	3,463.13)	380.72
Transfer to "Mycologia" Endowment Fund			) 2,500.00)	
Nathaniel Lord Britton and Elizabeth Gertrude Britton Fund:				
Research, exploration, publication, purchase of plants, books, specimens, etc.	120.99	1,957.70	2,078.69	
	$ 4,637.30	$17,420.53	$19,282.49	$ 2,775.34
Special funds contributed for specific purposes:				
School for Gardeners	$ 1,463.57	$ 466.45	$ 492.67	$ 1,437.35
Southern Appalachian and Rocky Mountain expeditions	185.08	2,174.20	2,193.16	166.12
Special study of grapes	56.79	100.00		156.79
Research aid		400.00	337.92	62.08
Others	122.35	60.00	38.75	143.60
	$ 1,827.79	$ 3,200.65	$ 3,062.50	$ 1,965.94
	$ 6,465.09	$20,621.18	$22,344.99	$ 4,741.28

AT THE NEW YORK FLOWER SHOW

Among the outstanding exhibits staged by members of The New York Botanical Garden at the International Flower Show in New York, March 15-20, was the large rose garden shown on the main floor by Mr. and Mrs. Marshall Field. Pleasing in its simplicity of design, with hybrid tea roses backed mainly by rhododendrons, it was noteworthy also for the excellence of the plants, a quality which frequenters of the Flower Show have learned to expect from the Field exhibits.

Daffodils were shown exceptionally well by Mr. J. P. Morgan, who staged a formal garden; he also displayed cut blooms for which a gold medal was awarded. Mr. Henry W. de Forest won first prize for a display of a dozen pots of blue freesias.

The clematis shown by Col. J. E. Spingarn was awarded the gold medal of the Garden Club of America and also a gold medal and a special prize from the Flower Show Committee. The citation announcing the medal from the Garden Club of America spoke of the educational value of the exhibit, its likelihood of stimulating other growers, and of its high standard of excellence. Col. Spingarn showed 150 plants, representing ten species native to the United States, seven native to Asia and Europe, thirty-two named varieties of large-flowered hybrids, and also unnamed seedlings of this group. Information about the species and the derivation of the principal hybrids was given on clearly printed placards, an additional one of which gave simple cultural directions. One small placard made clear the pronunciation of the name, giving it as *clem*'-a-tis, with the admonition, "*Don't* say clem-*at*'-is or clem-*ay*'-tis."

Col. Robert H. Montgomery of Cos Cob, Conn., and Coconut Grove, Fla., was awarded first prize for a garden consisting largely of Japanese primulas. He also won for this display the trophy of the International Exposition Company, presented for the finest of four exhibits in the class which called for a garden of seasonal material covering approximately 375 square feet of space. This was Col. Montgomery's initial garden exhibit at the Flower Show, and his display was looked upon as an outstanding achievement. Not only were his Japanese primulas of exceptional quality, but this was the first time that these plants have appeared in any quantity at a New York show.

EASTER DISPLAY AT THE GARDEN

A record crowd of 20,000 visited the special display in Conservatory Range No. 1 between Good Friday (March 26) and Easter Sunday, and throughout the following week several additional thousand people came daily to view the flowers.

To make room for the Easter plants, the large collection of begonias was moved into another section of the conservatory. More than 5,000 pots of plants at the height of their bloom comprised this early spring exhibit.

The original show included more than 300 Easter lilies, several thousand tulips, many narcissi and hyacinths, more than 200 pots of flowering bulbs from South Africa, a similar number of showy South African annuals, about 250 cinerarias of many colors, and 500 primulas in variety, in addition to innumerable other species and varieties of flowering plants, many of which are rarely seen elsewhere in cultivation.

Among several types of Easter lilies grown for the early spring show, by far the finest were the plants of *Lilium longiflorum* variety Americus, of which fifty bulbs were donated by William M. Hunt & Company of New York City.

HONORARY SCROLL PRESENTED TO DR. SMALL

One of the five honorary scrolls to be awarded this year by the Columbia Graduate School Alumni Association was presented to Dr. John K. Small of The New York Botanical Garden. The recipients were chosen in recognition of their "outstanding contributions to the human race." Announcement of the awards was made March 2.

Dr. Small's scroll, which is signed by Marston T. Bogert, Chairman, and Charles J. Hoffmann, Secretary of the Association, speaks of Dr. Small "as having made an outstanding contribution as a botanist and by his plant collections and popular and scientific studies which have made life more tolerable; as an explorer and author concerning the flora of southeastern United States."

Other recipients of scrolls this year were William Crocker, Director of the Boyce Thompson Institute; Victor Emanuel Levine, Professor of Biological Chemistry at Creighton University, Jesse Feiring Williams of Teachers' College, and Blanche Colton Williams of Hunter College.

THE JAPANESE BEETLE AND IRIS RHIZOME ROT

The bacteria causing the foul-smelling iris rhizome rot gain entrance into the plant tissues through wounds resulting from careless breaking of leaves and wounding of rhizomes and roots in cultivation. It is also well known that the iris borer, *Macronoctua onusta,* is an important factor in spreading the disease. The young larvae bore into the leaves in the spring, affording an excellent opportunity for the entrance of the bacteria. The rot quickly spreads down the leaves and into the rhizomes.

Another agent for the spread of the disease may be the larvae of the Japanese beetle. During the early part of October last year several plants in the new iris garden were found completely rotted. As this bed was on a slope where rain water from the infected plants could run down around the lower plants, the conditions were right for a rapid extension of the disease. While digging out the dead plants and treating others showing earlier stages of the rot, we often found larvae of the Japanese beetle feeding near the crowns and roots. As there were no iris borers present it seems very likely that the beetle larvae by their feeding were a prime factor in the original infections. The soil in this plot had been given a rather light surface application of arsenate of lead just before the grass seed was sown. This part of the old lawn had been infested with Japanese beetle larvae for several years past. Because the soil was very poor an additional two or three inches of untreated good soil was added in July in preparation for the new iris planting. Whether the larvae found in October came from eggs laid after the irises were planted or whether the eggs had been laid in the old soil previously is uncertain.

In an effort to stop the spread of the rot the dead plants were dug up and destroyed, and the soil was drenched with a solution of semesan. Plants that were only partially rotted were freed from the decayed parts and treated with semesan. All of the beds were then given a surface application of powdered arsenate of lead, 10 pounds to 1,000 square feet. The effect of this poison on irises is a question, but it was evident that the beetle infestation must be checked if control of the rot was to be obtained.

B. O. Dodge.

NOTES, NEWS, AND COMMENT

Speaking at the monthly conference of the scientific staff and registered students of the Garden on March 10, Ellys Butler Moldenke reviewed her experiences in studying the Patellariaceae in European herbaria. Robert Hagelstein told of his many excursions made last year for the collection of Myxomycetes in eastern United States.

* * *

A. E. Porsild, Botanist with the National Museum of Canada at Ottawa, Ontario, spent several days at The New York Botanical Garden in March, studying plants of Yukon Territory by comparison with our extensive herbarium material.

* * *

Clement G. Bowers, author of "Observations of Hardiness in Ghent Hybrid Azaleas and their Allies," which appears on page 73 this month, is a former student at The New York Botanical Garden and the author of "Rhododendrons and Azaleas," an important work of 549 pages, published last year by Macmillan. In a future issue of the *Journal,* Dr. Bowers will write of the outdoor culture of azaleas.

* * *

The following visiting botanists registered in the library during the winter: Dr. E. D. Merrill, Jamaica Plain, Mass.; Dr. Lyman B. Smith, Cambridge, Mass.; Mr. Stuart K. Harris, Boston, Mass.; Mr. A. Gershoy, Burlington, Vt.; Miss Mildred T. Travis, Dr. F. W. Pennell, and Mr. Arthur N. Leeds, Philadelphia, Pa.; Dr. Edward H. Graham, Pittsburgh, Pa.; Mr. Robert T. Clausen, Ithaca, N. Y.; Mr. C. J. Hylander, Hamilton, N. Y.; Mr. and Mrs. Mahmoud Helmy, Royal Egyptian Legation, Washington, D. C.; Dr. William C. Steere and Dr. Carl D. LaRue, Ann Arbor, Mich.; Dr. D. T. MacDougal, Carmel, Calif.; Mr. G. R. Bisby, Imperial Mycological Institute, Kew, England; Mr. André de Vilmorin, Paris, France, and Dr. Mel T. Cook, Rio Piedras, Puerto Rico.

* * *

Dr. John Hendley Barnhart has recently received a certificate of his election in May, 1936, to correspondent membership in the Academy of Natural Sciences of Philadelphia. He has also been made a corresponding member of the Philadelphia Botanical Club.

* * *

Dr. W. H. Camp returned March 21 after more than three months in Mexico, where he collected extensively in the mountains of western, central, and eastern Oaxaca. In addition to several duplicate sets of herbarium specimens, in which the Vacciniaceae and Ericaceae, collected for special study, predominate, he brought back nearly a hundred different kinds of living plants, among them orchids, bromeliads, cacti, and other succulents.

REVIEWS OF RECENT BOOKS

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

From Forest to Furniture

Malcolm H. Sherwood's recent contribution to the study of wood [1] pleasantly serves the desirable purpose of awakening the reader from a too frequent lethargic state in which, because he is blinded to the romance that may be interwoven even with the commonplace, he accepts objects around him as things to be taken for granted. In this study the object is *wood,* and the author shows how ample a scope the discriminating eye of the connoisseur and the esthetic taste of the artist have in furniture and cabinet-making—not merely as trades but as forms of art.

Sixty different woods are described in as many chapters, and if there be any criticism it would concern the brevity of the accounts. Technicalities have been deliberately avoided and in their place appear through interesting anecdotes the personal experiences of an author whose extensive contacts with the subject lend them a piquancy that is an asset. For the student, a supplementary table, a bibliography, and an index give additional value to the book.

Edmund H. Fulling.

A Masterpiece on Trees

While much has been written by many authors on trees and their relation to humanity, to Dr. Cross must go the palm for originality of presentation in his book on trees.[2] The reader is captivated and imbued with the author's own enthusiasm and love for his subject.

In a literary style that possesses force as well as arresting charm Dr. Cross vividly portrays the part that trees have played in the welfare of nations and of peoples. Writing at a time when floods and dust storms are forcing the people off the land and threatening to cut down our productive areas, he expounds with no uncertain force the story of the crimes that have been perpetrated against our forests, leaving us today a legacy that must be paid off in human suffering.

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[1] Sherwood, Malcolm H., From Forest to Furniture. 284 pages, illustrated, indexed. W. W. Norton & Co., New York. 1936. $3.

[2] Cross, Dr. P. G., Our Friends the Trees, 322 pages, illustrated, indexed. E. P. Dutton & Co., New York, 1936. $5.

In a country that is fast approaching that fullness of nationhood which demands that all our natural resources should be jealously guarded against depletion, this book carries a message and a warning that no thinking American can afford to ignore, for it drives home with clear-cut phrases the fact that the presence of trees is a national asset while their absence increases the load of human woe and constitutes a national calamity of the first magnitude.

It is a book that can be profitably enjoyed not only by those who own trees, or those whose lives are "blissfully cast amongst them," but particularly by every city dweller, for it will teach him the companionship of trees that really are the friends of man.

For the tree owner, also, the book is a mine of information on the care, repair, and upkeep of trees. There is a long list of trees suitable for different situations as well as helpful advice on pruning, feeding, and planting. The author's advice on the management of evergreens is sound, as is the way in which he treats the subject of hedges and windbreaks. Applying the information given, the tree owner cannot fail to get the most from his trees.

In whatever phase of trees he treats, Dr. Cross writes dynamically. His facts and information have been marshalled with diligence and accuracy, yet given with simplicity and directness and the sincere conviction of a man who has a thorough grasp of his subject.

Altogether "Our Friends the Trees" is a laudable work.

P. J. McKenna.

Plant Propagation, Vines, and Fragrant Plants

A concise treatment of most phases of plant propagation for the garden is offered in Dr. Fairburn's well written little book.[3] Planned especially for beginners in gardening, this volume explains in detail the various methods of propagation such as seeds, cuttings, layering, division, as well as budding and grafting. It treats of the fundamental principles of the care of propagation materials, which is so essential for any degree of success. The illustrations will help to clarify the descriptions in the mind of the gardener. Many will be disappointed to find no mention of the various growth substances that are sweeping the country with their popularity. However, as a whole, this book can be recommended to the garden enthusiast for its practical contents.

I find Miss Jenkins' book on vines [4] rather a brief treatment for

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[3] Fairburn, Dr. David C. Plant Propagation for the Garden. 115 pages, illustrated, indexed. Doubleday, Doran & Company, New York. 1937. $1.

[4] Jenkins, Dorothy H. Vines For Every Garden. 95 pages, illustrated, indexed. Doubleday, Doran & Company, New York. 1937. $1.

such a broad subject. However, the selection of annual vines is quite complete and should prove interesting to the novice. Many helpful suggestions are given for the planting and use of each vine mentioned. In her discussion of perennial vines, however, the author has omitted much of the important information which the novice should know beforehand . . . such information as the difference in sexes of plants like *Celastrus scandens,* and the detrimental effect of the Japanese beetle on many of this group. The fancier will find no mention of many of the rarer vines or the shrubs that may be treated as vines with a bit of training. The conclusion has a brief descriptive index which classifies each subject mentioned.

Anne Dorrance's book [5] should prove interesting to those who like the fragrant gardens which of late have become quite popular. The author has divided the fragrance of flowers into three seasons: early, midsummer, and late. One third of her book has been devoted to a list of fragrant plants with brief descriptions as to their color, scent, and time of bloom. However, an amateur would have to use this list with discretion, as many of the plants mentioned are not hardy in the north. The last few pages are devoted to the making of perfumes by the novice from garden flowers.

JOSEPH TANSEY.

GARDENING TASKS MONTH BY MONTH

A little book that should prove useful to the amateur is Cecile Hulse Matschat's Garden Calendar.[6] It deals extensively with garden operations to be done month by month throughout the year.

Its main fault is that it tells what to do rather than how, so that one must have some knowledge of gardening and considerable equipment before being able to put its suggestions into practice. Granted these means, beginners who do not know just how and when to commence their work may be guided in the systematic arrangement of their gardening tasks. Even through the winter months, when most people think that gardening is at a standstill, this little book holds many suggestions, such as the care of house plants, spraying of trees and shrubs, proper cleaning of tools, and many other things to which time can not be devoted during the busy season. With a little common sense and sufficient study of plant materials, this garden calendar should be a practical guide for garden lovers in both temperate and sub-tropical regions.

HILDEGARD SCHNEIDER.

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[5] Dorrance, Anne. Fragrance in the Garden. 96 pages, illustrated, indexed. Doubleday, Doran & Company, New York. 1937. $1.

[6] Matschat, Cecile Hulse, The Garden Calendar. 118 pages, illustrated. Houghton Mifflin Company, Boston. 1936. $1.

THE NEW YORK BOTANICAL GARDEN

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MEMBERSHIP IN THE GARDEN

Established as a privately endowed institution, aided partially by City appropriations, The New York Botanical Garden is dependent for its progress largely upon benefactions and memberships. Through these means, though young as botanical gardens go, it has become the third largest institution of its kind, its library, herbarium, and horticultural collections ranking among the finest and most complete in any country.

Membership in The New York Botanical Garden, therefore, means promotion of scientific research in botany and the advancement of horticultural interests. Scientifically, the Garden is able to serve as a clearing-house of information for students and botanists all over the world; horticulturally, it often serves as a link between the plant explorer or breeder and the gardening public.

Through memberships and benefactions, provision is made at the Botanical Garden for the training of young scientists and student gardeners; hundreds of new books are added annually to the library, which is open daily to the public for research and reading; free exhibits are maintained in the museum, the greenhouses, and gardens, and lectures, courses, and free information in botany and gardening are given to the public.

Each individual member of the Garden receives:

(1) A copy of the Journal every month.

(2) A copy of Addisonia twice a year, each number illustrated with eight colored plates of unusual plants, accompanied by complete descriptions and other pertinent information.

(3) A share of surplus plant material of interesting or new varieties whenever it is distributed.

(4) Announcements of special floral displays at the Garden from season to season.

(5) Credit, to the extent of the membership fee paid, toward courses of study offered by the Garden.

A limited number of garden clubs are accepted as affiliates. The privileges of affiliation are a subscription to the Journal, announcements of displays, a specially conducted tour of the grounds and greenhouses, and a lecture once a year by a selected member of the staff.

Fellowships or scholarships for practical student-training in horticulture or for botanical research may be established by bequest or other benefaction either in perpetuity or for a definite period.

The classes of membership and types of benefaction are as follows:

Annual Member	annual fee	$ 10
Sustaining Member	annual fee	25
Garden Club Affiliation	annual fee for club	25
Fellowship Member	annual fee	100
Member for Life	single contribution	250
Fellow for Life	single contribution	1,000
Patron	single contribution	5,000
Benefactor	single contribution	25,000

Contributions to the Garden may be deducted from taxable incomes. The following is a legally approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ————————.

Conditional bequests may be made with income payable to donor or any designated beneficiary during his or her lifetime.

All requests for further information should be addressed to The New York Botanical Garden, Bronx Park, New York, N. Y.

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

MAY, 1937

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THE THOMPSON MEMORIAL ROCK GARDEN

Established as a memorial to Dr. W. Gilman Thompson, a former President of The New York Botanical Garden, the large rock garden secluded between the two ridges east of the Museum Building is serving horticulture in an important way.

Visitors who come to view its many thousands of plants during Rock Garden Week and the month or more which follows will find there not only broad drifts of color designed for a pleasing picture, but will be able to observe hundreds of different kinds of plants which have been acquired from countries far and near.

Even in the larger plantings of well known material, new or seldom seen varieties and species will be discovered. Other rarities will be found in small groups or single specimens, tucked away where their blooms will appear as pure gems set among the rocks.

In planting these carefully chosen subjects, each is given the situation best suited to its growth, whether that be a limestone crevice, a peaty bog, a moraine, a wooded slope, a spot within reach of the spray from a waterfall, a heath or a grassy meadow or any other special location.

From all over the world the Botanical Garden has gathered these plants for the rock garden. Through correspondence with collectors and growers and by exchange with other institutions in many countries, new species and others as yet little known in cultivation have been introduced into the Thompson Memorial Rock Garden. Native plants which are suited to rock garden cultivation are brought in from the region around New York. Other natives have been acquired from The New York Botanical Garden's own expeditions into the southern Appalachians and Rocky Mountains.

The Botanical Garden is always ready to give information on the source and culture of the plants which it is attempting to introduce for the future enrichment of gardens.

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ROCK GARDEN WEEK

The last week in May will be observed as Rock Garden Week at The New York Botanical Garden, because this period is expected to open the season when the Thompson Memorial Rock Garden may be seen at its best. Special announcements are being issued to members and others, inviting them to visit the garden for an exclusive preview May 21 and 22. Rock Garden Week itself will extend from May 23 to 30.

Among the showiest plants to be seen during that week will be the first of the many species and varieties of *Dianthus,* numerous *Primula* varieties, and many kinds of *Arabis, Iberis, Alyssum,* and related genera of crucifers, besides hundreds of other rock garden plants which will then be in bloom, some in broad drifts of color, others in small groups or as individual specimens. The season of exuberant bloom will last well into June, and all through the summer and fall there will be plants of interest in the rock garden. The end of May, however, has been selected as the time when the visitor can see the most in flower.

The American Rock Garden Society will make a special trip to the Thompson Memorial Rock Garden the day after its annual meeting and show in New York the last of May. Other gardening organizations are also making special arrangements to visit the rock garden, not only during Rock Garden Week, but also at other times throughout May and June.

Signs are being erected throughout the grounds to point the way for visitors to the Thompson Memorial Rock Garden, which lies in the glade east of the museum building. The gates will be kept open daily from 10 to 5.

A SIMPLE PROGRAM FOR DISEASE AND PEST CONTROL IN GARDENS

This is the season when home gardeners should be giving some thought to the problems of disease and pest control. Abundant bloom and foliage when the flowers first appear do not necessarily mean their continuance throughout the summer. Annuals, perennials, shrubs, vines, and trees should be watched assiduously for signs of infestation. A few simple measures applied at the beginning—that is, when the first signs of insects or disease appear—will help to keep the garden at the peak of health until the flowers have been taken by the autumn frosts.

The brief notes below comprise a summary of a lecture given by the writer at the Botanical Garden last February 13. Four divisions of pests and diseases are recognized here: sucking insects; chewing insects; fungous, bacterial, and virus diseases; and nematode or eelworm diseases. Remedies for each on the common garden plants of the vicinity are given under each division. One of the first rules of all to remember is never to throw refuse from any diseased plant on the compost heap. Handle it carefully and burn it at once.

Some common sucking insects: (1) Aphids or plant lice. (2) Lace-bugs on azalea and rhododendron. (3) Mealy-bugs. (4) Scale insects. (5) Mites causing delphinium blacks and red-spider mites on many kinds of plants in dry weather. (6) Leaf-hoppers. (7) White-flies. (8) Thrips.

Remedies: Use contact spray materials such as nicotine sulphate compounds (tobacco extracts) or pyrethrum and rotenone preparations. Follow directions on container. Hit the under sides of the leaves. Use a fine spray with high pressure. Keep the sprayer clean. Nicotine dusts are easier to apply but less effective and more expensive.

Certain plants infested with sucking insects require different measures of control. Important ones are listed here.

For root aphids on asters, iris, etc., dig in tobacco dust around the base of plants.

Mealy-bugs on any plant are best controlled by forcibly spraying infested plants with a fine spray from the garden hose.

Roses, lilacs, ash-trees, dogwoods, and willows infested with scale insects should be sprayed in the spring, before buds open, with either commercial lime sulphur, 1:8, or a miscible oil, 1:16.

Japanese cherry, euonymus, tulip-poplar and magnolia harboring scale insects should be sprayed with a miscible oil, 1:16.

Some evergreens, such as Mugho and Scotch pines, harboring the needle scale insects may be sprayed with lime sulphur, 1:8, while dormant. Summer sprays with the contact insecticides are safer for evergreens in general.

Plants such as hollyhock, phlox, evergreens, etc., infested with red-spider mites should be dusted often with a fine dusting sulphur; or when spraying use high pressure.

Leafhoppers (on dahlias, for example) are repelled by bordeaux mixture.

Soak gladiolus corms (from plants previously infested with thrips) with mercuric chloride 1:1000, or one ounce to eight gallons of water, for two hours. Spray with contact sprays if necessary later.

Chewing insects: (1) Caterpillars, bagworms, tent caterpillars and the like. (2) Beetles, such as the rose chafer, blister beetle, elm-leaf beetle, willow beetle, May beetle, Japanese and brown Asiatic beetles, etc.

Remedies: (a) Spray plants with arsenate of lead, one ounce to one gallon of water, or 4 to 6 pounds to 100 gallons. The arsenate acts more as a repellent against Japanese beetles.

(b) Beetles on blossom of roses, peonies, marigolds, etc., should be knocked off into a can of kerosene. Beetle traps are useful if the neighbors coöperate by also setting traps.

(c) If grubs of May beetle, Japanese beetle, etc., are killing lawn grasses, apply 10 pounds of arsenate of lead to each 1,000 square feet of lawn. Add sand or dry soil to aid in distributing it evenly; if applied as a spray, wash it in well with water.

(d) In early spring burn all leaves and rubbish on iris beds where plants have been infested with the borer.

(e) Cane borers of lilac and other plants can be killed by inserting a flexible wire; or cut out and burn infested canes.

Common fungous, bacterial and virus diseases: (1) Powdery mildews on roses, grapes, lilacs, phlox, chrysanthemums, asters, etc. (2) Spot diseases such as rose black-spot, hollyhock rust,

leaf-spots of phlox, 'mums, dahlias, etc. (3) Gray mold on lilies, roses, peonies, etc. (4) Delphinium bacterial black-spot, twig-blight of lilac, rhododendron die-back, iris rhizome rot, delphinium root rot, aster and dahlia wilts. (5) Perennial rusts on sempervivum and blackberries. (6) Virus diseases of asters, dahlias, lilies, etc.

Remedies: For plants infected with mildew, dust as needed. Begin early, dust when the foliage is *dry,* and when there is little wind. Avoid applying too much dust at once.

Dust roses once a week with a fine dusting sulphur for black-spot; the same for hollyhock rust.

Plants infected with gray mold should be sprayed with bordeaux mixture. Pull back the mulching on peonies so that the base of the plants will keep dry in the spring.

Cut out and burn blighted branches on lilac and rhododendron. Also cut and burn leaves and tops of delphiniums showing black-spot. In the spring spray the ground around delphiniums with bordeaux mixture if they showed black-spot the previous year.

Cut out iris rhizomes showing a foul-smelling bacterial soft-rot. Saturate soil with semesan as directed or use some other reliable disinfectant.

To sterilize garden plots where wilt diseases and root-rots have been severe, pulverize soil down to ten inches or so. Saturate thoroughly with formaldehyde, 1:50. If the soil is dry use 1:100 and use more of the solution. After ten days the plot may be planted.

Destroy sempervivum plants and blackberries showing perennial rusts.

Do not plant dahlia roots or lily bulbs from plants that showed mosaic (a virus disease) the previous year.

Nematode or eelworm diseases and their cures: Phlox and certain other garden plants are attacked by a stem nematode. The worms come up inside the stems and branches, causing dwarfing and deformation of leaves. Dig up and destroy such plants.

Garden 'mums are sometimes attacked by leaf nematodes. To avoid them use cuttings from healthy plants. If they appear, contact sprays applied frequently will kill both nematodes and aphids. If plants are diseased, rotate your crops or sterilize the soil.

B. O. Dodge.

WESTERN PLANTS IN EASTERN ROCK GARDENS

If there is one province of gardening in which the precept "American plants for American gardens" must be taken with a grain of salt, it may well be lowland rock gardening, as in New York and the New England states. Even here, insofar as it contains an urge to explore and appreciate the flora of this and other regions of our country, it is an excellent precept, but as an indication of the comparative practical worth of native and exotic plants it seems hardly acceptable.

Difficult as it is to express an estimate of their comparative importance in tangible terms, I venture, nevertheless, to present such a comparison—not by way of a precise statement, but rather as a matter of practical judgment. Out of every hundred first-rate plants for rock gardens in the area indicated, I judge that approximately eighty-five represent Old World materials, twelve eastern United States and three western United States sorts. By the adjective *western* I mean, here, anything west of Ohio; and in the last two figures I am counting only endemic materials. To what extent the ratio here presented may eventually be changed, that is another guess. I rather doubt that it will be very greatly altered. I do not look for new introductions of eastern United States plants in such numbers as to affect the present ratio. As to western plants, the low percentage accorded them here does not represent the comparative number of western plants which are or may be made available, but rather the comparative number of them which prove upon practical trial to be satisfactory, reasonably permanent things for eastern gardens.

It seems rather an ironic disposition of nature that the flora of our eastern rock gardens, compared with that of western European gardens, instead of reflecting the great plant-wealth of our western states, should render so poor an account of it. I am not at all willing to admit that this bespeaks (as has so often been said) a lack of appreciation on our part of the western flora. I believe that the climate of northwestern Europe lends itself far better than ours to the successful cultivation of western United States plants.

My experience and observations lead me to the conclusion that not one in fifty western plants available today can be grown successfully—that is, with an assurance of long life—in our eastern

rock gardens. A really worth-while rock-garden plant, I take it, must be both attractive and reasonably permanent. My estimate, therefore, excludes many beautiful western things which, though they may last a year or two in our gardens, must be continually renewed. With certain notable exceptions, the adjective *western*, in my experience, is synonymous with *difficult* or *impermanent*. Wishing to miss out on no worth-while discovery, one continues to experiment with these easily accessible western plants. But I have come to set down my trials of them as comparatively unprofitable, pleasurable as they may be. Trials of unfamiliar Old World or eastern United States plants yield a much larger percentage of first-rate materials. As to the suitability of plants from other regions to our eastern rock gardens, we live nearer to the Alps and the Himalayas than to the Rocky Mountains.

Illustrations of the comparative difficulty of western plants abound. Who, for instance, finds it difficult to grow any of the hardy species of *Sedum* from the eastern United States or from the Old World? Yet, how many of the western kinds succeed in our gardens? Again, in *Iris*—with the exception of certain notoriously difficult groups, such as the Onccyclus—what hardy Old World or eastern United States species cannot be readily grown in our gardens? But who succeeds for any length of time with the western kinds? I have, from time to time, grown and flowered a number of them, and yet, there is not a good clump of any of them in my garden today. I find the line clearly drawn even between closely related sorts that look, for all the world, as though they should succeed under similar treatment. The eastern *Iris cristata* is not at all difficult. *I. lacustris,* which would seem to be simply a smaller version of it, behaves very poorly for me. *Dicentra eximia,* our eastern species, thrives and self-sows like a weed in my garden. *D. formosa,* from the West, simply will not grow for me. I admit that I have seen it thriving here and there, but I cannot seem to make it grow.

Shall we say that lewisias, brodiaeas, calochortus and western erythroniums are generally satisfactory plants in eastern gardens? I do not think so. They will not last in my garden. If I would have them, I must plant them again and again. During the time that I have been trying these things without success, excellent bulbous plants have come into my garden from other parts of the world.

Undoubtedly other gardeners, more skilled than I, will at times succeed where I have failed with western plants. The common experience may, perhaps, fall out a little more favorably in eastern gardens closer to the seashore than mine. But I feel justified in observing that, as a lot, western United States plants are far from

Mahonia Aquifolium, one of the best of western shrubs for eastern culture. Its blossoms, fruits, and shining evergreen leaves which are often reddish are equally beautiful in successive seasons.

satisfactory for amateurs' rock gardens in these parts; and that their practical value for eastern rock gardens has been rather seriously exaggerated in late years in our gardening magazines. The glowing accounts of them appearing in such publications have for the greater part come straight from the West, without benefit of practical trial in eastern gardens.

A glance at my garden records reveals exceedingly meager net results from trials of western plants. In fact they do not nearly measure up to the humble three percent in my estimate, which allows for a good many plants with which others have succeeded and I have failed. I find today only the following really good and abiding plants of considerable garden merit:

Actinea (Tetraneuris) simplex
Aquilegia caerulea
Eriogonum umbellatum
Eriophyllum caespitosum
Mahonia Aquifolium
Malvastrum coccineum
Petrophytum caespitosum
Sedum oreganum
Vancouveria hexandra
Viola rugulosa

Besides these, there are a few plants concerning which I prefer to reserve judgment. They include *Polemonium carneum,* and the new *Talinum Okanoganense*—both very beautiful things, which I hope may prove fairly long-lived. But in view of the almost unlimited wealth of lovely abiding things which are available from other sources, I am not inclined to count every beautiful and fleeting westerner among the list of first-rate plants, or even of good plants. Undoubtedly, western plants will continue to intrigue the curiosity of gardeners, and to provide interesting play for skillful experimentation. But as far as any general use or recommendation of them is concerned for amateurs' gardens, I am satisfied that, on the whole, they represent a most difficult and unsatisfactory lot.

Let us have "American plants for American gardens"—by all means, in so far as we can find first-rate American plants. But let us, above all, insist on the best only.

P. J. van Melle.

COLLECTING EXCURSIONS FOR MYXOMYCETES

Nearly 1,000 specimens of Myxomycetes have been added to the Herbarium of The New York Botanical Garden during the past year of 1936. A few have been acquired by exchange with other students, but the great majority were collected in the field with the assistance of my associates, Mr. Joseph H. Rispaud and Mr. John D. Thomas. A series of eight separate trips which were made into the mountains of Maine, New Hampshire, Vermont, New York, New Jersey, Pennsylvania, and Virginia required more than 6,000 miles of automobile traveling and more than eight weeks of time during the collecting season from June to November.

Among the rare species gathered, several were found for the first time east of the region of the Pacific Coast and one species and one form of another for the first time in North America.

An early trip in June to the northern reaches of the Catskills, in Schoharie County, New York, was not productive, as the elusive forms were not yet in fruit, so advantage was taken of the opportunity to visit the State Museum at Albany, and arrange with Dr. H. D. House, State Botanist, for the examination, verification, and boxing of the Museum's collection of Myxomycetes, which has since been done. Excursions to the same region in October and November yielded several interesting species. Among

An unusual form of *Fuligo septica* found by the author while collecting Myxomycetes in the Catskills last fall.

them were numerous developments of a form which so far has not been reported from North America, a phase of the common *Fuligo septica* (L.) Weber with the cortex replaced by a brain-like layer of perfected sporangia.

The wild, wooded, mountainous regions of Pike County, Penn sylvania, and Sussex County, New Jersey, on opposite sides of the Delaware River, were fruitful fields where more than 90 species were collected over several trips. *Cribraria oregana* Gilb. was found near High Point, in Sussex County. This species, which bears its spores in a brown net resembling a tiny bird-cage on a pole, was proposed by Gilbert in 1932, and so far has not been reported elsewhere than from Oregon. We also found the rare species, *Didymium anomalum* Sturg., recognizable by the white calcareous processes like microscopic pillars connecting the upper and lower layers of the form. This was later collected repeatedly in Pike County, and on one occasion in great abundance. In Pike County were also found several other rare forms: the globular nets of *Hemitrichia abietina* (Wig.) List. on slender

stalks, the black *Hymenobolina parasitica* Zukal and the brown *Kleistobolus pusillus* Lipp., the last two consisting of minute cups covered with glassy lids, beneath which lie many large, loose, shining spores. *Licea flexuosa* Pers., a form which is sometimes serpentine in outline, of deep brown with bright yellow spores, was likewise collected there.

The longest journey, in August, was made through the forests and mountains of Maine, New Hampshire, and Vermont. Conditions were not too good because of the long prevailing dry weather, but nevertheless hundreds of developments were found in damp wooded areas, and among them was the black and yellow *Trichia cascadensis* Gilb., whose spores are intermingled in the cupules with free threads. This species so far has not been reported from eastern North America. An interesting feature of this trip was a visit to the great Ripogenus Dam, built in the deep forest some forty miles north of Moosehead Lake, Maine.

The foray of the Mycological Society of America at Mountain Lake, Virginia, in September, was a pleasant affair for the members and friends who took part. The lake is situated at an altitude of nearly 4,000 feet, affording superb mountain views and opportunities for collecting at fairly high altitudes. The party was delightfully located in the cottages and laboratory of the University of Virginia, which maintains a summer station there. Bearing chestnut trees were plentiful in the region, so abundant collections of *Arcyria globosa* Schw. were made. This species fruits only upon the old burs of chestnut, where it is noticeable because it powders the burs with white dots.

Collecting on Long Island, where we reside, was continued during the intervals between the outside excursions. Another new record for Long Island, and at the same time for North America, was the finding of *Physarum ovisporum* G. List., recognized by its irregular, rough mottling with a deposit of white lime.

The sum of the entire season's collecting was 135 species, represented by more than 1,200 fruitings. The majority have been boxed and added to the Garden's Herbarium, and the remainder will be used for exchange purposes.

ROBERT HAGELSTEIN.

EXHIBIT OF FUNGI AT PARIS WORLD'S FAIR

At the World's Fair which opened in Paris the first of May, part of the scientific exhibit shows the work of Dr. B. O. Dodge on sexuality and hybridization among the ascomycetes. The invitation to contribute a display came from Dr. R. Kühner, Professor of Botany at the Sorbonne.

The exhibit, which covers about 9 by 12 feet of wall space, is concerned with three genera with which Dr. Dodge has done special work: *Neurospora, Gelasinospora,* and *Pleurage.* The principal one among these is *Neurospora,* the bakery mold, which for untold centuries, until present-day sanitation has helped to eradicate it, has been the plague of bakers, and which in every known war has also caused bread in great quantities to become uneatable.

Sixty-three mounted photographs in seven series of nine pictures each tell the story of these fungi. There is a master caption for each set and a separate caption for each photograph.

The first row shows the morphology and gives the general life history of all three genera. A colored photograph showing striking sex-linked characters is included in this series.

In the second set is shown the effect of spermatization on fecundation, followed by pictures taken at six-hour intervals to show the development of the fungus that has been fertilized. Number three contrasts the "normal" fecundation illustrated above with a newly discovered type, brought about by using monilioid conidia. In the row below, phases of fecundation through nuclear migration, without the aid of "male" or "female" bodies are shown.

Three stories are told in series number five: The first interspecific hybrids produced in fungi are shown from Dr. Dodge's photographs made during his first research on this subject in 1927. Next is illustrated mendelian segregation of albino types as contrasted with orange-colored wild types; also segregation of sex factors is shown. Third, the effect of lethal factors in producing ascus abortion in *Neurospora tetrasperma,* a species from Surinam, is illustrated. The sixth set of pictures reveals how the lethal factor may be carried over into another species, through interspecific hybridization, with the same effect as above. This work illustrates for the first time mendelian dominance among the fungi.

The seventh series of photographs shows reactions between bisexual and unisexual races in the fungi under investigation.

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SOME OF THE PLANTS TO BE SEEN IN THE THOMPSON MEMORIAL ROCK GARDEN DURING MAY

1. *Houstonia serpyllifolia*
2. *Campanula cochlearifolia*
3. *Tulipa biflora turkestanica*
4. *Alyssum saxatile*
5. *Ramondia pyrenaica*
6. *Gypsophila repens*
7. *Viola Priceana*

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PROFESSOR C. CONZATTI: AN APPRECIATION

On a table in my office, as I write this, are stacked more than seven hundred carefully pressed specimens collected within the last few months by one of the most interesting and remarkable men it ever has been my pleasure to meet. For some years we have been in correspondence concerning certain of the Mexican Ericales but it was not until last winter that I had the pleasure of making his acquaintance.

It was one of those warm brilliant days such as Oaxaca knows in December. I had found my way to a street at the edge of town and knocked at a great iron-studded door. During the brief moment I waited, I looked to the north toward El Cerro de San Felipe standing guard over the Valley of Oaxaca. This mountain is a botanical shrine and is the type locality of numerous species. That day its lower slopes were drenched in the golden sunshine of southern Mexico. Its crest, reaching nearly two miles into the air, had caught a passing cloud and was draped in a billowy shawl. Presently I heard the scrape of a latch, and with the creak of old hinges the great door swung open. There was a flash of sunlight on plants blooming in a Mexican patio and then before me with outstretched arms, welcoming me into his house, stood Professor Conzatti.

He is slight of build, but with an erect carriage that belies his years. He has a wealth of silver hair, keen eyes, and a radiant smile that matches the sun in his garden. We embraced as old friends in the Mexican manner and I was ushered into his home.

I wish that I might describe his patio garden, but the species it contains would fill a book:—fragrant oranges; coffee bushes with red fruit; pots with rare sedums; trees, shrubs, and herbs in profusion, some of them bearing his own name. Nearly a hundred new species are due to his collecting and study, and the caesalpiniaceous *Conzattia* with its graceful thornless stems and gorgeous flowers, seemingly dipped in the yellow of old gold, is so like him that no more fitting monument could have been chosen by Dr. Rose when he named this genus.

Prof. Cassiano Conzatti was born Aug. 13, 1862, at Civezzano, near Trent, Tridentine Venice, at that time under Austrian rule.[1] In 1865 the family moved to Borgo Sacco near Rovereto. There

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[1] These essential facts have been taken from a brief autobiography prepared at my request and now on file in the Library of The New York Botanical Garden.

he finished his elementary education and in 1876 he entered the Rovereto High School, but was unable to finish because of the death of his father.

Approaching the age when he would be forced into military service under the Austrian flag he took advantage of an offer to join an Italian colonization expedition to Mexico, landing at Vera Cruz with his mother and older brother in 1881 after a voyage of 36 days.

Photograph of Professor Conzatti taken March 3, 1937, while pressing plants near the "ball-court" of the ancient ruins on Monte Albán, near Oaxaca.

They settled in the village of Manuel Gonzalez about four miles from the city of Huatusco and lived there for two years, during which time other members of his family joined the colonists. Moving into Jalapa, he matriculated at a private college and, having mastered the Spanish language, was graduated and later became a teacher at the County School of Coatepec. He was soon transferred to the New Vera Cruz Normal School at Jalapa.

In December 1889 he was promoted to the Directorship of the

Orizaba Model School and in 1891 was given charge of the Oaxaca Normal School for Teachers. This post he held for nearly twenty years until forced to resign on account of ill health. It was during this period that his interest in plants was crystalized through friendship with such men as the Reverend Lucius C. Smith, who lived in Oaxaca, and Dr. C. G. Pringle, dean of Mexican collectors, who visited the region on numerous occasions between 1894 and 1906. Dr. Pringle was accompanied by Prof. Conzatti on various trips and the recently published notes[2] of Dr. Pringle indicate that Prof. Conzatti was a trusted friend.

Through the effort of Prof. Conzatti and under the approval of the Department of Agriculture and Public Works, a Botanical Garden was founded at Oaxaca, later supplemented by an Agricultural Experiment Station. Professor Conzatti was appointed Director of the Garden at the end of 1909. For nearly five years he labored at this task against tremendous odds and with a negligible budget. Just as the Oaxaca Botanical Garden was beginning to take shape and the ground becoming green with its hundreds of species of plants, its Director awoke one day to find that some petty official had decided that there was no place for the Garden in the Experiment Station and had plowed it under, ostensibly to plant maize. Today, even the building which housed the Agricultural Experiment Station is a pile of ruins.

After this painful reversal, Professor Conzatti in October 1915 was appointed Associate of the Division of Biological Research, then under the direction of Prof. A. L. Herrera. In March 1916 he was promoted to the post of Sectional Head in the Institute of General and Medical Biology, Division of Biological Research, where he labored until December 1918. In January 1919 he was appointed Resident Explorer of Oaxaca for the Division of Biological Research, and held this position until March 1922.

In April 1922 he was appointed Chief Technical Inspector for the Installation of New Schools for the State of Oaxaca. He continued in this position until April 1924 when he became Federal Inspector of Schools in the State of Oaxaca. He served in this capacity until December 1927. Thus ended 47 years of continuous public service in official capacities. A truly enviable record.

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[2] The editor of these notes (Life and Work of Cyrus Guernsey Pringle by H. B. Davis) has confused the Professor with his son Hugo, who also accompanied Dr. Pringle on several excursions near Oaxaca.

I trust that Professor Conzatti will pardon this intrusion into his private life, but it is so much a part of him that I cannot resist recounting certain events as told to me by a mutual friend. His long service with the public schools was rewarded by a pension in the form of bonds. These bonds later were repudiated. The year he retired from public service his house was badly damaged by an earthquake. He rebuilt it. In 1932 a more severe earthquake damaged it still further. He rebuilt again, but this time his financial resources were sadly depleted. The discomforts and trials he has had through these last years are known only to himself. In the same situation many lesser men would have turned their faces to the wall. But not Cassiano Conzatti. Long ago he was cast in a different mold. Others might have failed, but his spirit has not dimmed. I found him in his herbarium, surrounded by his books and specimens, busily at work on the manuscript of "A Revision of the Flora of Mexico."

I cherish the hours spent with him collecting in the swamps of the Valley of Oaxaca and among the ancient ruins on Monte Albán where, years ago, he collected with Pringle and Smith. I often think of the laughter we shared, piecing together a conversation with bits of Spanish, English, French, Italian, and Latin—neither of us being fluent in a common tongue. Nor can I ever forget his great personal charm, his genuine enthusiasm and wistful desire that his work might be of some use to the world. It was cold the morning I left Oaxaca, yet he had walked the long distance to the station just to bid farewell and wish me a safe journey. One remembers such things—always.

W. H. Camp.

TEN COMPLETE SCIENCE COURSE

Ten students received certificates for completion of the Science Course for Professional Gardeners offered by The New York Botanical Garden in brief exercises conducted April 19 in the rooms of the Horticultural Society of New York, where the weekly lectures have been given.

Four of the graduates this year were student gardeners who for the past two years or more have been working full time at the Botanical Garden and attending the Science Course, which is part of their training. One was an exchange student from Kew,

England, who received a certificate for the two courses which he completed during his year here, and the other five came from estates around New York. This was the fifth graduation ceremony for members of the course, which was started in 1932. The studies undertaken include systematic botany (two terms), plant physiology, plant morphology, plant pathology, entomology, soils and fertilizers, and plant breeding.

Henry de Forest Baldwin, Vice-president of The New York Botanical Garden, was the first to address the graduating students at their exercises. He spoke of horticulture as an art—a democratic art—which appeals to all civilized mankind, and of professional gardeners as teachers or evangelists who are able to show other men how to produce surroundings of beauty for themselves.

"The greatest reward of life," he said, "is found in seeking beauty as an end in itself."

To pursue any art, he pointed out, requires discipline; in some arts, exclusive dedication of oneself. But in gardening, substantial and satisfactory results can be obtained when it is followed only as an avocation. Even then, he admonished, it should be approached with sincerity and intelligence, and that is where the background of science becomes useful.

"The investment made in this course," he said to the student gardeners, "is an investment which can not be lost. It will accumulate dividends for you as long as you live."

Mrs. Dorothy E. Hansell, in speaking for the National Association of Gardeners, pledged the continued support of that organization as long as the Garden should sponsor training for professional gardeners.

Two of the first graduates of the course, J. G. Esson and P. J. McKenna, addressed the students, Mr. Esson defining a "skilled gardener" with a century-old quotation from Loudon's Encyclopedia of Gardening: "A skilled gardener is one who is skilled in horticultural production, whether that production relates to utility, ornament, or recreation."

Mr. McKenna, in emphasizing the advantages of study, said that had more men in this country previously studied principles such as are taught in the science course, there would be less human suffering today as a result of the misuse of natural resources, with the attendant floods, erosion, and droughts. In defining their

profession he said to the student gardeners: "Your factory is the green leaf, and your laboratory the earth. It is your business to work with nature, not against it. Without the fundamentals such as you have been learning, ultimate success in your field is impossible. The profession of horticulture in this enlightened day calls for knowledge, experience, and training."

Dr. H. A. Gleason, who presided, closed the ceremonies with a short address in which he pointed to the need of keeping on learning and applying all useful knowledge available to the practice of horticulture. The best gardeners, he concluded, possess three essential qualities: being good plantsmen, being endowed with the gift of leadership, and having a general knowledge which extends beyond the immediate field of horticulture.

Certificates were presented by Dr. Forman T. McLean to John Armstrong, Martin James Crehan, John James Harrison, and Franklin C. Moore of The New York Botanical Garden and to William G. Cabrey, Jr., Eric Lawaetz, David Penson, Edward W. Robinson, and John Andrew Smith. Charles J. Collins, exchange student from Kew, received his upon his return from a western trip, just before sailing back to England.

CORN PRODUCTS SHOWN IN NEW EXHIBIT

Commercial products of corn and how they are developed, from the time the seed is planted until the manufactured article is packaged for the market, are shown in a new exhibit on the main floor of the museum building.

Maps indicate the principal corn-growing regions of the United States and of the world. Charts in color picture the corn plant and its growth and show details of the structure of the ears and kernels. On the major chart, every process of manufacture is traced from the ripe corn to the finished packages of feed, meal, starch, dextrine, syrup, sugar, and oil. The exhibit has been contributed to the Botanical Garden by the Corn Products Refining Company.

Also in the display are shown two measuring devices, one for determining the angle between the leaf and stem in a stalk of corn, the other for recording the length, diameter, and shape of an ear of corn. The leaf-angle indicates the suitability of a variety of corn for a certain locality, an acute angle indicating a drought-

resistant quality, Dr. Basil M. Bensin, designer of the apparatus, explains. The second instrument is the one which was used in making measurements for the regional types of corn which are shown in an adjoining exhibit. These were explained in the December Journal.

In an additional exhibit, three original charts by Dr. Bensin illustrate ecological studies of corn-plant ecotypes which appear under certain environmental conditions in various agricultural regions. By systematic comparative studies of such types from different parts of the world, Dr. Bensin explains, a basis for standard methods of culture, acclimatization, and introduction of new crop plants could be established for each agricultural region.

NOTES, NEWS, AND COMMENT

Spring vacation time in universities and colleges brought a number of botanists to The New York Botanical Garden for special study. From Michigan came Dr. William C. Steere, extending his work on mosses, Dr. Alexander H. Smith, proceeding with special work on the higher fungi, and Frederick J. Hermann, continuing his studies of the Juncaceae. Prof. H. E. McMinn came from Mills College, Calif., Prof. Erling Dorf from Princeton University, Robert T. Clausen from the Bailey Hortorium at Ithaca, Prof. Bernard S. Meyer from Ohio State University, and Reed C. Rollins and Alan A. Beetle from the Gray Herbarium at Harvard. Dr. Ralph C. Benedict brought a group of students from Brooklyn College. Dr. Helen Purdy Beale of the Boyce Thompson Institute was among other April visitors.

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At the monthly conference of the staff and registered students of the Garden on April 14, Dr. W. H. Camp spoke on "Continental Migration and Plant Distribution."

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Dr. A. B. Stout has been appointed Collaborator of the United States Forest Service, his coöperation to be particularly in the newly developed work in tree breeding, of which Dr. E. J. Schreiner, a former student at the Garden, is in special charge.

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Walter S. Groesbeck, who had been Clerk and Accountant for The New York Botanical Garden since 1899, retired from active service with the Garden as of May 1. At the same time, Henry Friedman, who had been his office associate for an almost equal number of years, also retired.

REVIEWS OF RECENT BOOKS

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

House-Plants for Everyone[1]

In his book on growing plants indoors, Allen Wood starts from the beginning—"from scratch," so to speak. He wishes his instruction to be so clear and detailed that "wayfaring men, though fools, shall not err therein." Most of us who have gardened for years do not want to confess ourselves fools or wayfarers, yet we are always beginners to some extent in this expanding world of flowers and each "house-planter" can find much that is interesting here. If for nothing else, the lists of new or fairly new plants suggest the possibility of many hopeful experiments.

Instruction is given for potting, repotting, soils; for giving ventilation, heat, light, water, food; for pruning, for the care of seedlings; suggestions for the home type of greenhouse and terrarium. Bulbous plants are considered, cacti and other succulents, vines, miscellaneous house-plants, insects and much else. A list of plants for decoration is given, with flowering period, color, botanical and common names.

One may question some details, and occasionally may not agree with the naming, which is not always in accordance with the Kew Index. One may feel that lists of mesembryanthema should include more of the actual Mesembryanthemum and Lampranthus types, which flower readily and profusely in pots under fairly cool conditions. One may think—having tried it—that *Gloriosa superba* would not be likely to flourish under house or even most home greenhouse conditions and wonder why the fact was not mentioned that *Crinum campanulatum* grows in water; but it is easy to find faults in any book of the kind and in this one there is much that is good and the rest is not so important. It will be very helpful to the indoor gardener.

Sarah V. Coombs.

Beauty Along the Highway[2]

"Roadsides, the Front Yard of the Nation," is a textbook for highway departments and their officials, and into the little book Mr. Bennett has managed to crowd a surprisingly large amount of information, including specifications for trees, shrubs, sod, grass and other seeds, formulas for fertilizers, etc.

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[1] Wood, Allen H. Jr. Grow Them Indoors. 221 pages, illustrated, indexed. Hale, Cushman & Flint, Boston, 1936. $1.75.

[2] Bennett, J. M. Roadsides, The Front Yard of the Nation. 233 pages, illustrated. The Stratford Company, Boston, 1936. $3.00.

The handling, planting, and pruning of trees is well taken care of. His definition of parkways, freeways, and highways is excellent and it is easily seen that the book was written by a man with vast experience in the handling of plant material for roadside purposes.

Such things as signs, gas stations, and roadside sanitation are discussed at length and with intelligence. Though a great opportunity was lost to bring out the fact that road improvement should begin with its design in relation to the existing landscape and contours, and though rather too little space is given to the design of the planting, it is a book well worth the writing and one extremely useful to anyone connected with highway or parkway improvements.

HERMANN W. MERKEL,
General Superintendent,
Westchester County Park Commission.

FINE PHOTOGRAPHS OF TREES[3]

All who admire trees in their varied aspects from season to season will enjoy Thomas O. Sheckell's picture-book, which contains 82 of his own photographs of trees, made over the years in many parts of the country. Turning the pages at random we find lone trees on rocky heights, dogwood and apple-trees in the fullness of their spring bloom, the eccentric Joshua-tree of the southwestern desert, a Torrey pine on the California coast, the inevitable but always picturesque Monterey cypresses, elms above a flowery meadow in New Jersey, snow-laden branches, the dead chestnuts of the East, giant redwoods, and landscapes in which trees predominate. The book carries the reader pleasantly into many regions of familiar scenes.

Selections from the original photographs which comprise the book were on view at the Botanical Garden during April.

CAROL H. WOODWARD.

GARDENS FOR CITY DWELLERS[4]

One hears so much about the trials of gardens in our large cities, about the dearth of trees, injuries from gas, soot, and improper light, that it is refreshing to find an occasional hopeful note. An attractive new volume tells an encouraging story of backyard and penthouse gardens, and reenforces this with even more attractive pictures of some of the fine gardens of the members of the City Gardens Club of New York, of which Miss McKenny is the able executive secretary. The style of the book

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[3] Sheckell, Thomas O. Trees. 82 illustrations, unpaged. Frederick A. Stokes Company, New York, 1936. $4.00.

[4] McKenny, Margaret, and Seymour, E. L. D. Your City Garden. 215 pages, illustrated, indexed. D. Appleton-Century Company, New York, 1937. $2.50.

is graceful and pleasing, more given to interesting anecdotes than to being over-burdened with prosy dictums. Such general suggestions as there are on garden building and care are terse and direct. One suspects this to be the work of Mr. Seymour particularly. Many entertaining items are sprinkled through, like the reference to the Chinese Actinidia-vine, which is apparently a rival of catnip in attracting cats. One wishes that somebody would discover a plant to drive cats away from the garden.

The list of plants recommended for city gardens is an extensive one, and one wonders if the picture of flowering rhododendrons and mountain laurels, hydrangeas and honeysuckles, may be a little too roseate. If so, those with courage to attempt gardens amid city skyscrapers need encouragement.

Window and conservatory gardens get their share of notice, and most appropriately the city garden clubs, which encourage the city dweller's planting activities, are given their just mead of praise.

FORMAN T. MCLEAN.

IN THE GREAT SMOKIES[5]

Reared near the Great Smokies and for the last ten years having spent half of each year in her cottage near Gatlinburg, Miss Thornborough brings to her book sincerity and authenticity. Hers is a genuine enthusiasm for this interesting area, but one detects here and there a bit of nostalgia for the days that are past, for the ghosts of the mountaineers who once peopled the valleys in what is now the Park Area stalk through its pages. The average vacationist will rejoice with the news that so many trails have been opened and graded, but to some of us old reactionaries who like peace even at the price of a bit of discomfort it is disconcerting to find that: "As late as 1932, the ascent (of Mt. Le Conte) was a true test of one's mountain climbing ability. Now, modern trails have made the ascent a simple matter, . . . In 1936, instead of a mere handful, the astounding number of ten thousand people climbed Le Conte. . . ." I was one of them, but did not know it was that bad.

The jacket tells us that: "This pleasing volume comes near to answering every question the prospective tourist could ask." The book does just that and does it so admirably that I can (vouching for its authenticity) unhesitatingly recommend it to those who have not yet visited the Great Smoky Mountains National Park and who in the near future intend to do a little "exploring" on its boulevard trails.

W. H. CAMP.

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[5] Thornborough, Laura. The Great Smoky Mountains. 147 pages, illustrated, indexed. Thomas Y. Crowell Company, New York, 1937. $2.00.

The Romance of Tea[6]

The next time you are invited to tea you might pause for a moment and think of the centuries of history that lie behind those crumpled tea leaves. It is difficult for the average person to satisfy the questions that inevitably arise in his mind, for many of the reference books and records are not available, some of them having been long out of print, while others are written in the mysterious characters of China. In "The Romance of Tea," however, Mr. Ukers has brought together the answers to these questions and has presented a complete treatment of the subject couched in understandable terms and told in an interesting way, even to the best recipes for making iced tea. While the sinologues might find fault with the way the fifth and sixth strokes of the character "ch'a" on page 5 are inscribed, the historical account of tea, its legendary origin in the mythical era of the emperor Shennung in China, its cultivation first as a medicinal and then as an article of commerce, the quaint story of Daruma, the Buddhist missionary from India to China in 520 A.D., and the systematization of the knowledge of tea cultivation in the Tea Classic, or *Ch'a Ching* written by Lu-Yu in 780 A.D., together with the spread of this knowledge through all of Asia, comprise a fascinating picture of romance and adventure.

After thrilling descriptions of the great expeditions after tea, from Marco Polo to Robert Fortune in 1843, and the commercial battles of even later years, the technique of planting tea and the different varieties are considered. Then come the social aspects of drinking tea, with reference particularly to its effect on the fine arts, such as oriental ceramics.

I wish this treatise could have ended right there; but no, as a concession to the practical side of modern existence we had to be told just how much tannin and caffeine are in tea—interesting, but not nearly so romantic as the story pictured by the Chinese Willow pattern, or glimpses of Dr. Samuel Johnson gulping endless cups of tea in his favorite haunts, or peeking into Mincing Lane to watch the excitement just before one of the China clippers was about to dock.

With so much material to compress between the covers of one volume it is no wonder that Mr. Ukers has to battle to keep his story from reading at times like a catalogue, but he does so with admirable success.

W. M. Porterfield.

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[6] Ukers, William H. The Romance of Tea. 276 pages, illustrated, indexed. Alfred A. Knopf, New York, 1936. $3.

THE NEW YORK BOTANICAL GARDEN

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Plants of the Vicinity of New York, by H. A. Gleason. 284 pages, illustrated. 1935. $1.65.

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The New York Botanical Garden is located in the Bronx, immediately north of the Zoological Park at Fordham Road, and at the south end of the Bronx River Parkway. It may be reached by local trains from Grand Central Terminal to the Botanical Garden Station (200th Street).

To reach the Garden by the Elevated and Subway systems, take the Third Avenue Elevated to the end of the line (Bronx Park Station); from the East and West Side subways, transfer from the Lexington or Seventh Avenue line to the Third Avenue Elevated at 149th Street and Third Avenue. By Eighth Avenue subway (Independent system) take a C or CC train to Bedford Park Boulevard (200th Street), then walk east to the Garden.

To come by motor from the city, drive north on Grand Concourse to Bedford Park Boulevard (200th Street), turn east there, and cross the railroad bridge into the Garden grounds.

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

JUNE, 1937

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THE OUTDOOR FLORAL DISPLAYS

Summer days bring with them a richness of garden bloom which is not spent until heavy frosts finally take the hardy chrysanthemums. On grounds that are carefully planned for all-season flowering, there may be a perpetual pageantry of color.

Such is the floral season at The New York Botanical Garden, where more than 6,000 roses of some 700 different varieties burst into splendid bloom in early June. They are seen in a second effulgence of flowering in October. Peonies—nearly 500 different kinds in labeled groups—join the roses with thousands of handsome flowers just as the Garden's 200 choice varieties of bearded iris are concluding their brief gay season.

The Thompson Memorial Rock Garden at that time is brightly carpeted, with most of the pinks in bloom and hundreds of other flowers complementing them in their profusion. The special perennial border maintained by the women's Advisory Council contains a wide selection of reliable garden plants which are at their best in the late spring and early fall, while another perennial border includes representatives of many other useful types of perennials carefully labeled. A display border of daylilies may be seen in bloom all summer long.

In the annual borders there is a continuous flower display from the middle of summer until late in the fall. Meanwhile many waterlilies, both hardy and tender varieties, adorn the two pools in the court of Conservatory Range No. 1.

When August comes, the cannas start their parade of primitive and pastel hues in flowers of a size that were undreamed of two decades ago. September bring billowy clouds of garden varieties of those fine hardy native asters which the English, who have selected many of them for culture, like to call Michaelmas daisies. Dahlias carry on the season from September until frost. Then in October, shortly before the indoor floral displays begin, the hardy chrysanthemums fling their autumn colors in the frosty air. Before many months are passed, the crocuses and daffodils start a new season of continuous bloom.

Gardeners who wish more than merely to enjoy the sight of these many flowers will always find here new ideas for their own gardens and grounds. To grow a wide and representative selection of plants and to further the introduction of worth-while novelties are among the aims of The New York Botanical Garden.

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WINTER IN OAXACA

A PAGE FROM A MEXICAN DIARY

Evening. The bells in the old cathedral across the drowsy plaza are chiming and a soft breeze stirs the leaves of the mango trees. The last streaks of a red sunset linger on the heights of Monte Albán, throwing into bold relief its series of fortified temples used by at least three ancient civilizations.

Below my balcony an ancient Indian woman sits beside a basket of oranges. She has been there since dawn and will remain until late tonight. They say she has been sitting in that same place for years—and will for many more; on the sunny side in the morning chill and, without moving, in the shade during the afternoon's heat. A few centavos each day; enough to tell the difference between life and death. And the dust of the street swirls around her. A few centavos; the sun in the morning; the shade in the afternoon . . . . the timelessness of long forgotten yesterdays and utter disregard of all tomorrow's morrows. For her, today is not the twilight of the past nor yet the dawn of any future. Today is nothing more than just today. And that is Mexico.

INTO THE MIXTECA

It all happened very suddenly, at least for Mexico, where time is not. It was heard that some commercial travelers were going into the Mixteca [1] and that they would stay for a day in Tlaxiaco, the most important town in the region. This would be time enough to collect a few plants as well as obtain a general view of the country to the west. So in a hurry I slammed enough collecting material for a day into the presses; at three A. M. the next morning the *mozo* woke me and by four we were on our

[1] "Mixteca" in ancient Nahuatl means *The place of mists.* In this region it was so foggy that but few photographs could be taken in the morning before 10 or 11 o'clock.

way. It was the sixteenth of December and the pre-dawn chill of the Oaxacan plateau crept into my bones.

There is a road—*El Camino Real,* The Royal Road—but it was worn out a century ago. Yet somehow, either through extreme carelessness—or hardiness—Mexican drivers on occasions during the dry season manage to push their automobiles over the mountains to Tlaxiaco.

The travel companions turned out to be anything but commercial. There was, of course, Don Tomás, who was to act as interpreter; a young fellow going home to the mountains; an American ethnologist; the driver and his assistant. The ethnologist was dropped off at Nochixtlan. The rest of us went on to Tlaxiaco.

If I were a surgeon I would set up in Tlaxiaco, if only to repair the livers shaken loose from those hardy souls who venture to ride *El Camino Real* in automobiles. The driver's assistant was a necessity for it was his function to test the few bridges on the way, to examine the depth of the fords, to fill up the oxcart ruts where they were too deep, to jack up the car and insert logs or stones when the under parts hung up on large rocks, as well as help with the general repairs. We broke springs three times—and the last hour pieces were falling out of the worst one. No one cared, for we were nearly there and the spring could be rebuilt. About a kilometer from town, the gear-shift lever pulled out of the transmission and the assistant held it in place the rest of the way by hand. Our souls arrived at Tlaxiaco at ten-thirty P.M. The bodies were not quite complete. Small chunks had been shed along the way.

We stayed at the best hotel in the town, really a fine place—but if you ever stay there take along some chlorine tablets for the water. It is pumped from a well in limestone located between the open latrine and the burro stalls, and is stored in an uncovered tank in the horse stable. The horses apparently do not mind. The host is a most congenial fellow and charges only for his beer. The native drinks, mostly unpronounceable and, for that matter, scarcely potable, are free.

I shall always feel a debt of gratitude to Don Carlos the host, for it was he who, somewhere out of the multitude of Tlaxiaco, dug up Guadelupe. I shall never forget 'Lupe standing there in the early morning cold of the upland, his all too scant *sarape*

"There is a road—*El Camino Real*—"

Near Teposcolula. Centuries old, this highway was a part of the early Spanish system of military roads in Mexico.

tight around his spare shoulders and his knees shivering so that his once-white cotton pantaloons were waving like pennants in a stiff breeze. Yet his face was stretched in a grin that was as warm as the sun that soon drove away the mists and cleared the sky for one of those brilliant winter days in the Mixteca.

The next morning the car was still being repaired and no one knew when it would return. It made no difference, for I had decided to walk back by a somewhat different route. On the way to Tlaxiaco several great ranges had been crossed and to the south and east of town another series of peaks was jostling against the clouds. It was the backbone of the Sierra Madre del Sur. The next several days were spent poking around the foothills and onto the upper slopes of these mountains.

It would be useless to mention the plants collected and besides, their identification is as yet incomplete. But the memory of some is still vivid. Great crimson penstemons and in a tiny seepage, high on the mountain-side, a gentian so purple that it was almost black. Nearby, the moist ground was pinky-lavender with the flowers of some dainty bladderwort, the plants so small that they had to be collected with forceps.

At these altitudes the madroño (*Arbutus* sp.) became so common that great forests of it were everywhere. The madroño is the largest of the Ericaceae (Heath family) and it makes such a hot fire that the early Indian craftsmen could not use the wood for tempering metal, but reserved it for their ancient smelters. It was in these forests that I came upon a curious thing: one mistletoe (its species are legion here) parasitic on another, which in turn was living on the juices of a madroño. The combination was too much. The madroño was dying.

It was late in December and the dry season was taking its toll of the flowers, but in the deep *barrancas* where a little water seeped out of the rocks, great masses of fern were draped. While stretching for a particularly choice specimen, I unwittingly dislodged a beautiful blue and green lizard from a crevice. He slithered down my arm and dove into my open shirt. If he thought he was getting into a safe retreat he was fooled. That particular "crevice in the rocks" underwent a remarkable series of earthquakes in the next three seconds.

Near this same place I heard a shout from 'Lupe and hurrying along I found that the burro which was carrying the plants had slipped off the trail and fallen over the cliff. Fortunately, after several somersaults, Old Flop-ears had landed feet down on a narrow ledge and after much heaving and grunting, was pushed back onto the path. Along this same route the trees were festooned with bromeliads and orchids and looking into their tops for plants that might be in flower, I did the same as the burro. But I was more fortunate. A gnarled oak was planted solidly in the path of my descent.

The market at Tlaxiaco is a gem, so oriental in character that it is difficult to believe one is anywhere in America while wandering in the plaza on a market day. By tacit understanding, the vendors are grouped according to their wares or products. Onions in one place; chilis in another; great heaps of fragrant pineapples; piles of ripe bananas; *patate* (palm-mat) merchants in a row; vendors of *sarapes,* each laying out his product close to the others of its kind. Only the hatters are perambulant, padding around the plaza with great stacks of *sombreros* on their heads.

The blankets of Tlaxiaco are unique in all Mexico. The Mixteca is a high, cold country and the *sarapes* made here on hand looms are of wool, woven with triple thread and combed.

". . . Another series of peaks . . . jostling against the clouds."
Mountains southeast of Tlaxiaco. Here the forests are mainly pine, oak and madroño. The trees along the streams are the Mexican cypress.

They are heavy, but soft as down. Their design, however, was a puzzle to me for many of them were not fashioned in a strictly Indian manner. Later I learned that some years ago a series of European lace patterns had been abandoned in this town by some traveler. The native weavers saw the possibilities in these strange designs and copied them faithfully, blowing them up to full blanket size. This explains why the central figure of many of them is angular with a hint of cubism. Fantastic as they appear, they yet are fashioned with such art and harmony of color that many of them deserve to be museum pieces. Their weavers, curiously enough, have maintained the original Mixtecan designs on the borders of their product.

I had come prepared for only one day's collecting and my presses were already too crowded. It was therefore with a heavy heart that I turned my back on Tlaxiaco, the "Pearl of the Mixteca," and headed eastward toward Cañon Tomellin and the railroad.

Early on the morning of the twentieth our little caravan,

consisting of Don Tomás, 'Lupe, two burros, and me bringing up the rear, set out on the return journey. The route lay to the northeast, across barren eroded hills and flat-topped ranges covered with one of the most amazing and complex oak forests in the world. I often breathed a sigh of relief that the proper season was past, for, had there been acorns, I would have had to collect. I have no idea where I would have put the specimens. But that is one place I have marked and to which I shall return some September when the fruits are ripe. I know that many new species of the genus *Quercus* are still to be found on those mountains.

From time to time the trail would dip into some deep *barranca* where, along the moist edges of the stream, great Mexican cypresses (*Taxodium mucronatum*) stood guard, sentinels against erosion. On the drier banks more scrophulariads—salmony red, crimson, and deep purple—as well as scarlet mints and gold composites, were common. The village of Huemelulpan was passed at noon and that evening with pungent alkali stinging our nostrils, we arrived at the town of Yolomecatl on the tail of a whirling dust storm.

The burros were unpacked and cared for first. It was therefore dark before we found a place to eat. We were served most graciously in the light of a guttering wax taper by the younger members of the household whose faces shone, dark and coppery, in the circle of its feeble flame. Eating to me is a pleasure but, to enjoy a meal in this region, one must also become accustomed to dining in a low hut and often on the mud floor amid the smoke of the cooking-fire, to sniveling, squalling brats and hungry dogs around your feet, to the company of the unwashed, to fleas, sometimes to other things—very private little things that crawl, and always to assorted smells—the known and the unclassified, and pungent food, so fortified with potent native condiments that scalding coffee, strong enough to float an egg, is a comfort to the palate and a genuine relief. And too, one must learn to eat without knife, fork, or spoon, using the ubiquitous *tortilla* as well as fingers and teeth in each capacity. A meal in the back-country of Mexico has more than the elements of high humor.

Long before the break of day, 'Lupe was up and eager to be on his way. It may have been a brave new dawn we faced, but it

certainly was a chilly one and my hands were numb as I helped arrange the packs on the burros. 'Lupe already had been out of his blankets for half an hour and was shivering so that he could scarce lift a basket. It took two great bowls apiece of steaming coffee sweetened with *panela,* the native unrefined sugar, to drive out the cold.

That day was much like the previous, save that the country was somewhat drier. We were now on the crest of the drainage divide where, in the rainy season, the water runs either to the north and the Gulf of Mexico, or to the south and the Pacific. Early in the afternoon we came to Teposcolula, an important town on the route. Stopping at a small *cantina* for a bit of refreshment, we found the host already four fingers deep in mezcal and, whether or no, we must join him. I made the fatal error of complimenting him on the quality of his hospitality and, not to be outdone in politeness, he requested—in fact, he required—me to sample each of his wares. It was not until after many more compliments that I succeeded in propping my genial host in a corner so securely that I could continue on my way without further entreaty.

Toward evening our little caravan worked its way up through a narrow cañon whose walls were yellow with sedums more than a meter in height and where, among the rocks, such a host of lesser succulents were seen as would make the rock gardener green with envy. The trees were hung with great clots of moss and lichen and each branch supported a mass of bromeliads and orchids. Here is another place to which I shall return some time and spend a week collecting its rarities. But then, time was short and the trail was long, so only a few specimens were taken and these jammed into presses already too full of plants. It was dusk with purple shadow resting on the *cumbre* when we made the pass and started the long tortuous descent to Tiltepec. We arrived there in the velvet blackness of night.

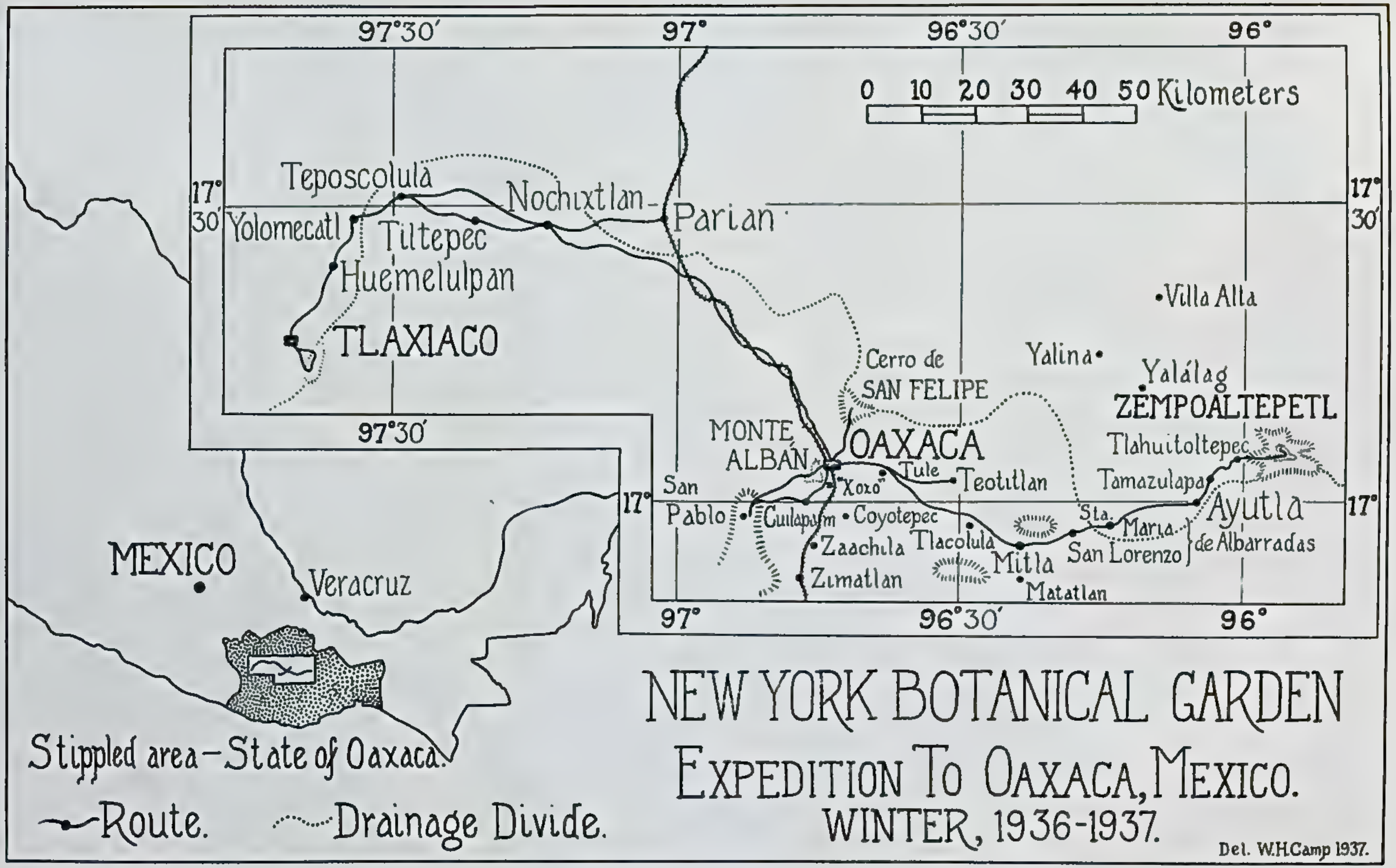
Tiltepec is a sorry little collection of thatched huts and, I think, has a story all its own. Don Tomás and I threw our *sarapes* down in the house with the mail carriers who were taking the Christmas mail into the Mixteca. Personally, I did but little resting. I never sleep well when hungry fleas and bed-bugs and myself, equally hungry, but less able to find a meal, are rolled into the same blanket.

I was up at dawn the next morning, rearranging the plants collected the previous day and airing others which showed signs of mildew. I learned a trick on this trip that stood me in good stead later. When one is short of driers, open the presses at night and let them become cold, then, early in the morning, pack them tightly and wrap in several thicknesses of palm matting. In this way one often can get a large series of plants back to an adequate supply of drying materials—and in fairly good condition—days after they have been collected.

Early in the afternoon we arrived at Nochixtlan, being welcomed by our ethnologist friend of the journey out. It was nice again to have more than a cup of water for washing and to eat food served in a room separate from the smoke of the fire. Here a treat awaited us: a pound can of my favorite vacuum-packed coffee. It was opened with due ceremony by the ethnologist and prepared with care over charcoal. The product, however, was unsatisfactory. It was exactly equal to the coffee I liked in the States, yet it lacked something of the pungent aromacity of the native brew. The tin was more useful than its contents, so the remainder was thrown out. It is curious how soon one can acquire a taste for coffee that has been burned black and almost charred in the roasting.

At Nochixtlan we bade farewell to 'Lupe. A most genial fellow, deep in the understanding of the fundamentals of the life he led and somewhat of a philosopher. A man with few taboos and no psychoses. And that, perhaps, was the cause of his undoing at Nochixtlan—but that is 'Lupe's private story. I feel richer for having known him.

Since the presses were full there was no point in walking, so I hired a riding horse. The plants were piled on a pack animal led by a *mozo* and on the morning of the twenty-third our little caravan headed east toward Parian, Cañon Tomellin and the railroad. The horse was a short-coupled buckskin bangtail with blood in his eye and fire in his feet. Two men were holding him as I mounted and I rode him, tail first, out of Nochixtlan. He had a curious little corkscrew buck that jarred everything loose out of my pockets. But he had a stout heart for the climbs and was excellent among rocks, being particularly efficient on the downgrade. Each time he stumbled or slipped on the loose rubble, he took a quick jump and squatted, thus catching his balance. For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17° 30′
Teposcolula
Yolomecatl
Tiltepec
Huemelulpan
Nochixtlan
Parian
TLAXIACO
Villa Alta
Yalina
Cerro de SAN FELIPE
Yalálag
ZEMPOALTEPETL
MONTE ALBÁN
OAXACA
Tlahuitoltepec
Tule
Teotitlan
Tamazulapa
San Pablo
Xoxo
Cuilapam
Coyotepec
Ayutla de Albarradas
Zaachila
Tlacolula
Sta. Maria
San Lorenzo
Zimatlan
Mitla
Matatlan
MEXICO
Veracruz
Stippled area – State of Oaxaca.
Route.
Drainage Divide.
NEW YORK BOTANICAL GARDEN
EXPEDITION TO OAXACA, MEXICO.
WINTER, 1936-1937.
Del. W.H.Camp 1937.

these reasons I forgave him when he aired his heels, as he did, at almost every village through which we passed.

Early in the day I lost Don Tomás and the *mozo,* and so rode east alone through forests of pine and oak with numerous clumps of mountain mahogany (*Cercocarpus* of the Rosaceae) or *zumu-iña* as it is sometimes called in this region. During this ride I passed many a village and town not on the map, not even the large-scale map issued by the Mexican Government in 1932 or the later map of 1936. Toward evening I began the long descent into Cañon Tomellin with its subtropical vegetation and rode into Parian after more than seven hours without ever having gotten out of the saddle. Considering the rough country and the weight carried, any normal horse would have been thoroughly chastened, but not this hill-bred buckskin. As we entered town, a piece of paper fluttered across the path. That was enough. For the next five minutes, to the delight of the population, we put on a private rodeo in the main and only street of Parian. I missed the train for Oaxaca by just fifteen minutes. It was the only Mexican conveyance I have ever known to be on time.

The train next morning was scheduled to leave at 6:10. By 6:30 a *mozo* came to carry our packs to the station; it was 9:30 when the ticket-window opened and at exactly 10:42, with much blowing of whistles, the Mexico Narrow-gauge Night Express —better known as the Oaxaca Roller-coaster—chuffed into the station. We arrived in Oaxaca late that afternoon and that night I put the plants between driers. It was Christmas Eve.

El Rio Zavaleta

I shall pass by sunny days along the Rio Atoyac and golden afternoons on Monte Albán amid the ruins of an ancient past. I shall skip the sleepy village of Santa Maria del Tule, where the greatest tree in all the world still grows, the largest of all the Mexican cypresses. I shall omit all mention of trips to the heights of El Cerro de San Felipe. Here is a mountain. It stands serene, a great massif reared nearly two miles into the air, keeping watch over the valley of Oaxaca. Each of these is a chapter in itself.

But far to the south and west, a great thumb of the Sierra Madre thrusts itself into the valley toward Zimatlan. As mountains go, it is not a great range and seems almost to be lost in that welter of peaks and deep *barrancas* of the Sierras of southern

Mexico. I doubt if you will find its name on any map; but visible from Monte Albán and far up on the slopes of that mountain, there is a great red scar. It is the village of San Pablo Cuatro Venados—Saint Paul of the Four Deer. I had read the story of this village, its people and the life they lead in a book as told by my friend Don Pablo [2]—and I wanted to visit the region. So, with a *mozo* who was not afraid of the Cuilapeños—it is death for a San Pablan to cross their country—I set out from Oaxaca on January twentieth with two horses and my duffle and headed for El Rio Zavaleta and the country of the San Pableños by a back trail through the territory of Cuilapam. This feud between the people of San Pablo and Cuilapam is just another of the many in this region. It is a land war and has lasted for over six hundred years. It is as active as when it began and the causes of its being are, if anything, more acute than the day it started. The fact that Cuilapam is a Mixtec town and San Pablo an ancient military outpost of the Zapotecs, only adds fuel to the fires of hate.

It was late in the afternoon when I arrived at the workings of the Zavaleta mine near the headwaters of the river of the same name. This mine, but recently abandoned, owing to certain unsettled conditions in the region, has been in operation since 1704. I unloaded hastily and the *mozo* returned to Oaxaca with the horses. There were several Zapotecs from Oaxaca at the mine dismantling the machinery and I was glad for their company. I established myself in what was once the kitchen of the old mine residence. Ordinarily I would prefer to camp in the open rather than around abandoned dwellings—there is something ghostly about them that I do not like—but the night winds are cold in these mountains, and I welcomed the protection of old walls.

That evening, just as the shadows were turning purple in the hills, I went down to the river to get some water. Above the roar of the torrent I heard a stone clink, and turning, looked straight into the eyes of one of the inhabitants of San Pablo. He was

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[2] "Don Pablo": M. Paul Van de Velde, eminent Belgian scholar, now resident in Oaxaca. The book: "Three Dollars a Year," by G. Russell Steininger and Paul Van de Velde. New York. 1935. Don Pablo owned and operated the Zavaleta mine for some years and, living there, almost under the village of San Pablo Quatro Venados, knew it well. The book is an authentic account of life, stark and primitive, in a typical Zapotecan village.

IN THE MIXTECA

1

2

3

4

1. *Tlaxiaco in the morning mist.*
2 & 3. *The market at Tlaxiaco.*
4. *'Lupe, philosopher and guide.*
5. *Scrub oak and giant cypress near Tlaxiaco.*
6. *'Lupe and the burros.*
7. *Tiltepec, a Mixtec hill town.*

5

6

7

armed to the teeth and standing there, his knotty muscles bulging through the holes in his tattered clothes, he looked like one mean *hombre*—even meaner than the scoundrel whose photograph appears opposite page 39 of Don Pablo's book. His weapons consisted of a very long and sharp *machete* slung handily in a sheath over his shoulder and an old muzzle-loaded rifle. These guns date from the time of the French intervention in Mexico and are so slow in firing that the San Pableños refer to them as *"esperame tantito"*, which means "wait a moment". I was on his land and so it was no more than right that he should demand my name and business.

Here was a ticklish situation, for my name would have been mere gibberish to him since it contained neither Zapotec nor Spanish words. My nationality would have been unsatisfactory for, even if he had never seen one, he no doubt had heard that *el gringo* was a devil. My business would have been a mystery and therefore to be feared, for "botanist", "herbarium", and "plant-specimen" are words not in his vocabulary. And so I told him that I was "Don Colorado, a Swiss doctor collecting plants for medicine." The explanation was satisfactory. My name, "the colored one", was most apt and had been given me by my friends of the market in Oaxaca, for to them my hair was *mucho rojo,* and my skin was burned a lobster hue by the Mexican sun. Since he had never heard of Switzerland, he could have heard nothing unpleasant about the people who live there, and I would have the benefit of any doubts he had. There was no lie in this, for once the name was Kampf and came from Canton Basel. As for the rest, I had no qualms, for many plants are used in their own *materia medica.* Here was a thing that he could fathom and appreciate, for he, being a mountain man and versed in the use of herbs, often did his own collecting. I hastened too, to assure him that I was a friend of Don Pablo. This was enough, for it was the speedy intervention of Don Pablo which had saved the inhabitants of his town from extinction by the Cuilapeños just a few years previous.

I spent several pleasant days clambering alone over the cliffs of this wild country and wading the tumultuous rapids of the Rio Zavaleta for the few plants that might be in flower on its sandy bars. But one evening, on a low spur of the mountain, I was suddenly surrounded by a group of these wild mountain men, all

". . . A great thumb of the Sierra Madre thrusts itself into the valley . . ." About an inch from the right margin and just under the main mass of the puff of cumulus cloud on the horizon is the scar of erosion below the village of San Pablo Quatro Venados. The line of vegetation in the valley marks the course of the Rio Zavaleta. The trees in the foreground are mesquite. Photo from the roof of the monastery of Cuilapam.

armed, who demanded in no uncertain terms that I state my business. Was I hunting minerals? (They have been exploited mercilessly and enslaved through the centuries by those who have sought gold in their mountains.) My explanation was easy to believe for I had a great pile of plants at my feet which were going into press. So to clinch my statements, I immediately took the pruning-shears out of the holster where I carried them and began cutting the specimens into suitable lengths. There was a shout and their women-folk, who had been hid in the *barranca,* came into view and they too crowded around to see the stranger and the new tool. Both men and women were jabbering in Zapotec, being more fluent in their own tongue than in Spanish. To me it sounded like a cage full of monkeys at feeding time. Being primitive children, they soon tired of the show and, gathering together a few twigs, made a fire and warmed a little food a few feet from where I was pressing my plants. They had been

on a visit to a neighboring town and one of the women had purchased a new waist. Like women all over the world, it must be passed among them and examined—and each one tried it on. I could understand no word of Zapotecan, but the inflections were unmistakable and compliments were passed between them. The vivid pink of the waist against their brown skins made a pleasing picture.

It was dark when I returned to camp, where I found that my companions at the mine had left and I was all alone. That night the moon was full and in the stillness, above the whisper of the river far below, I heard an eerie chanting. Its wavering four-note tune seemed to come from out the sky—or nowhere. It was these primitive folk, far above me on the mountain, chanting at the altar of *El Chancque,* their ancient Zapotecan god, a spirit so omnipotent that, among these people who worship many idols, no image of it is ever made.

The next morning Erastro and the others returned with ox-carts and the specimens were loaded on them. That afternoon he and I walked the sixteen miles back to Oaxaca by the old trail over Monte Albán. The slow-plodding oxen arrived the next morning.

W. H. Camp.

Next month: "The Mountain which has Twenty Peaks" —the story of Zempoaltepetl.

THE SPRING MUSHROOM

Many people are under the impression that there is one edible mushroom and the remainder are all poisonous "toadstools." The reverse of this is actually true: there are many edible mushrooms and comparatively few that are poisonous. The question commonly asked of the mycologist is, "How do you distinguish a mushroom from a toadstool?" To the botanist there is no difference, the so-called "toadstool" being merely a poisonous mushroom. There is no definite rule by which the poisonous mushrooms can be separated from the edible forms. One must learn to know them and distinguish them as they would distinguish their friends from their enemies.

The form introduced in this article is one of which no one need to entertain any fear. It has so much personality that it cannot possibly be confused with any poisonous species, as is

true of many of the other forms. In the first place it occurs almost exclusively in the month of May in this region. It has a stout usually whitish stem and a honey-colored top which is filled with deep pits, giving it a sponge-like appearance. Of course the plants should be collected while fresh and before they have begun to decay or turn dark.

While this species, *Morchella esculenta* (Fig. 1), has frequently been collected by the writer about New York City, only rarely has it been found in large numbers. On May 23 while collecting near his home in Elmsford, the writer encountered an especially

Figure 1. *Morchella esculenta,* the edible morel, which appears in May. About two thirds natural size.

FIGURE 2. A basketful of morels, an unusual quantity to be found in one spot in the woods.

fine group of the fruiting bodies of this species. About 75 of them were collected, filling an entire basket (FIG. 2), and more might have been found had the time been taken.

Professor Underwood once referred to this species as "a storehouse of nitrogenous food as luscious as an oyster and for an equal weight containing even more nutritious matter," and lamented the fact that more of this material was not made use of in this country. It is truly a delicious fungus, which may be safely eaten by anyone who is fortunate enough to find it in quantity.

FRED J. SEAVER.

THE PUBLIC DISPLAY GARDEN OF DAYLILIES

The Garden's collection of daylilies (*Hemerocallis*), which is now located along the path to the northwest corner of the museum building, reaches its climax in the display of flowers during late June and early July, though many plants may be seen there in bloom any time from early May until late in September. The name of each species and variety is embossed on a copper ribbon which is fastened to an upright stake.

The collection contains (1) representatives of the known species of daylilies, (2) wild plants which exhibit variations in certain of the species, (3) typical hybrids obtained from cross-breeding various species, and (4) plants of many of the horiticultural clones. A special effort is being made to obtain at least one plant of each of the many horticultural clones that are introduced into garden culture. Most of these are donated by nurserymen with the understanding that the Garden will not propagate them for distribution. The Garden does not propagate any daylilies either for sale or general distribution.

Since the previous report* was published many new clones have been added and the collection is now the most complete and extensive in existence. It thus enables gardeners and nurserymen to become acquainted with the numerous daylilies and affords opportunity for the evaluation of the different kinds according to merit and class. This is a need which is strongly felt among growers today, because the horticultural group of daylilies is now in that stage of development which is characterized by a somewhat rapid and indiscriminate increase of clonal varieties, many of which have no distinctive merit. Since the list of 174 horticultural clones, representing the developments since 1890, was published in the book "Daylilies" in 1934, *at least 99 new clones have been named* and, judging from the persons who are raising large numbers of seedlings, many more will be introduced into culture very soon.

With so many new plants on the market some are bound to be much alike and the average gardener is not always able to recognize their distinctive characters. The Botanical Garden's collection is intended to aid those growers who wish to raise daylilies of the

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* Jour. N. Y. Bot. Gard. **34**: 135-139. 1933.

Daylilies, at the peak of their season in late June and early July. This collection, which is northwest of the museum building, is the most complete and extensive in existence.

greatest charm and reliability to make a fair evaluation of the species, varieties, and horticultural clones in each class.

A collection of early-flowering seedling daylilies from The New York Botanical Garden was exhibited at the show of the American Iris Society May 28-30 at Rockefeller Center, New York City. The group included the eyed, fulvous, reddish fulvous, yellow, and orange types in many forms of flower, and contained some selections which are being considered for propagation.

A. B. Stout.

REVIEWS OF RECENT BOOKS

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

Week-end Gardening [1]

"Friday-to-Monday Gardening" makes me thrill with enjoyment with Margaret Goldsmith in all her efforts over the week-end to transform a neglected limestone quarry into a garden of bloom. Rarely has a book described with such fascinating charm the transformation of disorganized rock and stone and a tumble-down building into a fascinating cottage, surrounded by nooks and corners, blossoms and fragrance. Each page has knowledge wrung from experience; each page has a bit of wit and humor; and every photograph is a revelation of romantic loveliness. The creation of beauty through a vivid imagination is just what we all would like to accomplish in our summer homes. The book makes me think of Wordsworth's lines: "'Tis a voice of enchantment, what ails her? She sees a mountain ascending, a vision of trees." All my garden friends must read it!

Emilie B. Kellogg.

Disease and Pest Control for Gardeners [2]

Home gardeners and others interested in growing ornamentals will be pleased to learn that there is available a clearly written book on the control of insect pests and fungous diseases which are altogether too common in our gardens. For many years Prof. H. H. Whetzel, Plant Pathologist of Cornell University, has

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[1] Goldsmith, Margaret. Friday-to-Monday Gardening. Illustrated with photographs in half-tone; indexed. 195 pages. Whittlesey House, McGraw-Hill, New York. 1937. $2.50.

[2] Westcott, Cynthia. The Plant Doctor. 228 pages, illustrated, indexed. Frederick A. Stokes Company, New York, 1937. $2.00.

advocated the idea of "The Plant Doctor," declaring that every community should have a plant doctor the same as a physician for consultation. Dr. Cynthia Westcott, a student and former associate of his, has proved the feasibility of such an idea. After a few years of trying out the system she has brought together in simple clear readable form the results of her experiences and those of others in the control of plant diseases and insect pests. She has arranged her suggestions to be carried out during successive months of the year, beginning with March and ending in November. Dr. Westcott claims that forty hours a year devoted to such work is sufficient in the average garden.

For the last chapter she has arranged alphabetically a number of names and other terms, each with a few helpful sentences of brief description. A quotation from the book under the heading "Paper bag gardening" will suffice to show the pleasing style which the author has adopted.

> "Fortunately such troubles among ornamentals do not affect the bread and butter of the home owner, only that of the nurseryman, but the shudder of pure horror that I feel when I see someone pull up a sick peony stalk by the soft, rotten, spore-covered base and then immediately handle healthy plants is almost as real as if I saw a surgeon plunge bare hands into a festering wound and then handle the next patient without even washing his hands. Pull up your rotting stalks by the tops, not the base, and drop them into your paper bag. If you have occasion to cut them out at the base have a solution of bichloride of mercury nearby and wash off your knife, and your hands if need be, in this. But remember that this is a virulent poison and do not get your fingers near your mouth until you wash them."

For the professional, as well as the home gardener, this is a valuable book.

B. O. Dodge.

The Names of Woody Plants [3]

Mr. Makins has written a useful book for the grower and student of woody plants, couching in easily understood language a great deal of information not before brought together in one volume. While it is primarily intended for use in Great Britain, every plant mentioned can be grown at some place in the United States, so the use of the book is not confined to any one area. The fact that 21 percent of the subjects included are North American indicates that the European interest surpasses our own in our native plants.

The scattered form of key used for identification is truly unfortunate, as it represents a style now recognized as unsatisfactory. The illustrations, which account for most of the 1,732 species described, serve if one is familiar with the plants, but are

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[3] Makins, F. K. The Identification of Trees and Shrubs. 326 pages, illustrated, indexed. E. P. Dutton & Company, New York, 1936. $4.00.

too diagrammatic to convey properly the appearance of the plants they represent. The North American ones are especially poor.

The book, however, should be a useful addition to the libraries of those interested in the names and places of origin of their woody plants, as it contains the majority of the plants they grow.

E. J. ALEXANDER.

"MIRACLE" PHOTOGRAPHY [4]

Arthur C. Pillsbury, in writing about the work that has absorbed him during the past 25 years and more, has produced a story fascinating for anyone to read, but of special interest to the photographer. He is the designer and maker of the first revolving lens panorama camera, and a great developer of lapse-time photography, by which many thousands of persons have been able to watch plants grow and flowers open on the screen.

The patience and ingenuity which have gone into his life work are elements which help to make his story an engrossing one. The detailed information on cameras and equipment, however, is only for the experienced photographer, especially the one who is contemplating similar work, for some of the equipment which he has assembled is so highly specialized that its cost is upward of a thousand dollars.

There is a great deal of scientific information in his book, but this is best left to the scientist to judge. The book is essentially a captivating story.

FLEDA GRIFFITH.

A GLANCE AT CURRENT LITERATURE*

The Garden Book which Thomas Jefferson kept for nearly sixty years, from 1766 to 1824, is described by Rodney H. True in the Proceedings of the American Philosophical Society, No. 6 of Volume 76. After depicting the contents and character of this unique record of early gardening in America, he concludes:

"As time passes, and the nation goes through its strenuous earlier years, the Garden Book of Jefferson continues to tell a quiet story of grapes and sea kale for the garden, of carp and chub for the fishpond, of plums and peaches, peas, radishes and squashes, and one can understand his longing to leave the man-made tumult of Philadelphia and Washington. The worn Garden Book seems to give a glimpse into the background of the life of one of the most significant and storm-tossed characters in our history, and in this close contact with plants and with the earth, we seem to find one of the real sources of his strength."

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[4] Pillsbury, Arthur C. Picturing Miracles of Plant and Animal Life. 236 pages, illustrated. J. B. Lippincott Company, Philadelphia, 1937. $3.00.

* All publications mentioned here—and many others—may be found in the Library of The New York Botanical Garden, in the Museum Building.

In the same issue of the Society's Proceedings, E. D. Merrill writes on "Palisot de Beauvois as an Overlooked American Botanist," telling of the large collections of American, as well as African and Haitian plants, which this early explorer lost through a series of misfortunes at sea. Palisot de Beauvois resided for some time in Philadelphia, teaching French and music, Dr. Merrill says, though there are few records of his sojourn there. He was elected to the American Philosophical Society in 1792.

* * *

Louise Beebe Wilder is the author of several outstanding articles in recent issues of *House and Garden.* "The Alpine Lawn" appeared in January, while in February and March there were descriptions of many varieties of pinks and zinnias for the garden.

* * *

Wild Flower, the quarterly publication of the Wild Flower Preservation Society, appeared in January in a new form. It is under the editorship of P. L. Ricker, with Alice Earl Hyde, Robert S. Lemmon, E. Lucy Braun, and E. T. Wherry as contributing editors.

* * *

Roots of trees spread with an average radius of one and one-third times the height of the tree, according to an article by A. F. Yeager, quoted in the April *Garden Digest* from *Better Homes and Gardens.* The study, which was carried on at the North Dakota Agricultural Experiment Station, also showed that practically all roots of trees and shrubs were to be found in the upper four feet of soil.

* * *

In the *Botanical Museum Leaflets* of Harvard University, Vol. 4, No. 8, Richard Evans Schultes describes the peyote-cult of the Indians of southwestern United States and Mexico, which is built around the narcotic cactus, *Lophophora Williamsii.* Reprints of the article have been issued.

* * *

Among plants of special interest treated in the April number of *The New Flora and Silva* are species of *Meconopsis* and *Lachenalia,* and varieties of *Weigela* and of the candelabra type of *Primula.* The gardening reminiscences of Compton Mackenzie are continued in this issue.

CAROL H. WOODWARD.

A specimen of the largest known flower in the world, *Amorphophallus Titanum,* came into bloom at The New York Botanical Garden June 8. A forthcoming issue of the Journal (probably August) will be largely devoted to this remarkable plant.

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THE NEW YORK BOTANICAL GARDEN

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JULY, 1937

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FORESTS OF THE BOTANICAL GARDEN

Cloaking the banks of the Bronx River where it flows through The New York Botanical Garden stand two magnificent woodlands, one a natural hemlock forest, the other a forty-acre tract of native deciduous trees.

Thirty-seven acres are occupied by the hemlocks, chiefly between the rock garden and the west bank of the river. The trees extend to the gorge and overlook the waterfall. Most of the deciduous forest land lies directly south, though a narrow strip borders the hemlocks along the river on the northeast, a number of trees adjoin the arboretum east of the river, and a large area which extends from the rose garden southward is also occupied by native oaks, maples, hickories, flowering dogwoods, birches, elms and beeches, and ash, sweet gum, sour gum, tulip, and sassafras trees.

Some of the native deciduous trees grow too in the hemlock forest, but no other conifers are there and nothing exotic has or ever will be planted. According to the original grant by which this land was ceded to the Garden, this forest is to be kept forever in its natural state. Undesirable underbrush and dead trees are removed, and in the past few years 3,000 young hemlocks have been added, but no exotic material is deliberately set out. The unfamiliar plants which one sometimes observes have seeded themselves from the horticultural areas at the Garden. They furnish interesting examples of how much at home certain foreign plants, especially those coming from eastern Asia, can be in eastern America.

Early in the season the woods will be found sheltering a number of the wild flowers of the region—spring beauties, fawn lilies, jack-in-the-pulpits, and others for which the nature-lover searches avidly each spring. Wild azalea and mountain laurel both may be found there. Ten miles of surfaced paths wind through all the woodlands, leading the wanderer back and forth, here and there across bridges, sometimes along the river, other times deep among trees, and always within sight of native wild flowers and birds. The forests along the Bronx River, especially around the Boulder Bridge, are, in fact, a mecca for bird students of New York City.

While the development of horticulture and botanical science are the two principal aims of the Botanical Garden, another outstanding purpose is the preservation of the native trees and smaller plants of the region and making them accessible for the pleasure of the people.

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WINTER IN OAXACA

(Continued from the June issue)

THE MOUNTAIN WHICH HAS TWENTY PEAKS

It was the nineteenth of February when I again set out from Oaxaca. This time Don Pablo took me as far as the ancient city of Mitla[1] where the ruins are. The new automobile road goes no farther. I was introduced to the head *mozo* who told me that Daniel would be my guide and would come for me at six the next morning. I had planned to spend the evening browsing around the ruins of Mictlan, the "House of the Dead" (*Mitla* is a corruption of the older name). At times the Zapotecan kings lived here, but Mictlan never was a fortress. Its principal building is the Palace of the High Priest whose office it was to watch over the bodies of the royal dead. Its walls were red—the color of the spirit world—and some of the original painted plaster may still be seen in its passageways and tombs. But the rain came down in torrents and I was forced to return to Casa La Sorpresa for the night.

Entering this house is a genuine "surprise" for its patio is a jungle of bougainvillea, of tall, scarlet hibiscus bushes, of orange and lime trees, of great climbing aroids and other vines. Don Pablo has taught Maria, who is in charge, how to mix tangy *habañero* and pungent native fruit. The patio of La Sorpresa, therefore, is literally an oasis in a dry and hungry land. That night Mitla was anything but arid and I dined in solitary splendor. The meal began with *sopa.* Then came *guajolote* and heaps of snowy *arroz mexicana* followed by *huevos rancheros* and *queso* with *frijoles fritos.* Finally came great mounds of *pan dulce* and deep mugs of steaming *café con leche.* Maria is justly famous for her pungent soups, her turkey and Mexican rice, for her eggs with piquant chili sauce, her cheese and fried beans. Her sweetened

[1] See the map on page 137 of the preceding number of the JOURNAL.

cakes and coffee are the perfect ending to a gourmand's dream. There are some who would find fault with such a meal, but they will also criticize the music and deep upholstery in their own—and lonely—heaven. As for me, my idea of a paradise would be to spend an eon not too far from plump Maria's kitchen.

I had made arrangements for an early breakfast the next morning and so was up and packed before six. At 6:45 the *cocinera* sleepily stirred up the kitchen fire. Daniel arrived at 7:05, introduced himself and informed me that the mules were "waiting." He carried out the boxes containing my collecting outfit and I hastily bolted my breakfast—only to sit on my heels while the brutes were caught, blindfolded, and loaded. Punctuality is a vice in Mexico. It was after eight o'clock when our string of mules left Mitla and headed east.

We soon entered the mountains and started the long climb upward, reaching the *cumbre* at about ten-thirty. We paused for a while in the pass to catch our breath. Behind us was El Cerro de Mitla and at the foot of this mountain, drowsing in the sun, the town which gave it its name. Mitla lies at the head of a wide flat-bottomed valley which twists its way between high cliffs and barren hills to join another at Oaxaca. It was just a few kilometers up this valley on February 28, 1923, that the Federal Constabulary surrounded more than three hundred *cerranos* (mountain-men) and killed them. They were armed raiders from the hills on their way to Oaxaca to steal women. Across the valley the mass of El Cerro de San Bartolo y Magdalena raised its peak into the air. Far to the south and west, the great ranges of the Sierra Madre del Sur piled up until they lost themselves in the distant blue of the horizon. Looking the other way from the pass we saw more mountains. We were on a mountain surrounded by mountains. We had left the fat valleys with their abundance and were heading into a tumultuous wilderness of peaks.

For a time Daniel pointed out the various places we could see and which he knew, mentioning others we would pass along the way. He talked at length of the towns of Yalalag and Villa Alta, where we hoped to visit. But all the while he talked, another thing was forming in my mind. Far to the east beyond our horizon—not shown on the map I had—I knew there was a mountain, the highest mountain in all the south of Mexico and so little known that its position has never been correctly marked. In ancient Nahuatl its full name is: *The mountain which has twenty peaks.* I

". . . Mitla where the ruins are."
Interior of a court in one of the temples. These intricate stonework designs were originally covered with a thin coating of plaster and painted a bright red.

told Daniel I would like to go there instead of Yalalag and Villa Alta and asked him what he knew of it.

"Nada, Patrón," he replied. "Nothing, Master. I have never been there, nor has any man of Mitla that I know. But we can find the place. It is beyond Ayutla in the country of the Mihis."

And that is how Daniel and I came to climb the mountain called *Zempoaltepetl.*

It was noon when we passed through San Lorenzo de Albarradas, a squalid little village on a barren hill. I asked Daniel if it were a Zapotec or Mihi town (the two great tribes of the region where we were). With scorn in his voice, he told me that the place was *puro castillano.* This puzzled me no end, for the town was not "pure Spanish" but Indian. Later I was to learn the pride these hill-men have in the heritage of their ancient habitations, some of them dating back a thousand years or more. Anything more recent than the Conquest is a "Spanish town," a place without tradition and an interloper on the scene.

Farther along we came to a famous landmark, a solitary palm perched on the top of a rock beside the trail. While resting here, a caravan of burros passed, carrying sacks of green coffee out of

the Mihi country. Later, this palm (*Brahea dulcis*) became common on the barren slopes where it furnishes the raw material for almost the only industry of San Lorenzo. It is from the leaves that the *patates* (palm-mats) famous in Oaxaca are made. Toward evening we scrambled up the steep trail into Santa Maria de Albarradas and stopped with one of Daniel's relatives.

That night the neighbors dropped in to see the stranger and hear the gossip of the trail. Daniel was an excellent raconteur and basked in the glory of his new responsibilities. It was a pleasant evening, listening to the soft and fluid Spanish of these people interspersed with bits of crackling Zapotec; an evening rich in anecdote and the lore of mountain folk; an evening full of pleasant laughter and companionship. But the stars, wheeling high above the patio wall, told me that it was time to unroll my blanket for the night, so I bade them all *buenas noches* and blew out the candle. As I fell asleep I heard, deep in the house, the dull thumping of a pestle in an old mortar as someone ground the maize for the next day's *tortilla* flour.

* * *

Out of Santa Maria, the trail swings abruptly upward and through a high pass. Behind us was the last of the ranges we had crossed the day before. Ahead were still higher ones which we yet must climb. Behind us was a barren land. Ahead, because the higher altitudes had brought more moisture, were forests full of oak and straight-boled pine. I had come to Mexico particularly to see the species of two families of plants, the Heath and Blueberry (Ericaceae and Vacciniaceae) and on these slopes they soon became more common. Species which up to that time had been to me but dried herbarium corpses I saw growing here beside the trail. It was a joy to find them with green leaves and growing twigs, and to my surprise, many were in flower. I had not hoped to be so fortunate.

Just before noon, we crossed another high range and as we came out of the pass, a vast panorama of peaks and mountain valleys opened up before us. Far ahead near the horizon was a great cloud. I had been watching its top for two days but this was the first time I had seen the base. It was a tumbled mass of cumuli with long fluffy streamers sailing off to leeward and was exactly as I had suspected, a cloud snagged on some towering peak. The peak was Zempoaltepetl. At three that afternoon we drove the mules into Ayutla.

Since leaving Santa Maria we had been in Mihi country, but this was the first of their towns through which we passed. Ayutla was once the principal place of the Mihi tribe and still is an important center of trade. It was market day and for the last hour we had been passing the people of this race going home along the trail. The men were dressed in white and the women mostly in gay skirts and vividly colored blouses.

The houses of the Mihi towns of this region are not packed together as are so many of those of the Zapotecs and Mixtecs that I know. The Mihis are a strictly agricultural people and feel the need of open space about them. From a distance their homes look neat, but in reality are little more than hovels and are dirty, as are mud-walled huts the world around. Travelers only occasionally come to Ayutla so the tourist trade is small. There is one large house and here Daniel and I found a place to sleep.

Ayutla boasts a "restaurant"—the meanest hut in town, and it was already overcrowded with its three or four patrons who reeked with the odor of raw native liquor. A low mud wall divides the restaurant proper from the kitchen. The one table is scarcely three feet long and less than half as wide. From under it Daniel and I were forced to roll a stinking lump of humanity before we could sit down to eat.

The *cocinera* soon appeared with a plate of *carne* and later with a stack of *tortillas*. The meat consisted of certain internal parts of a cow cut into convenient lengths; parts rich in vitamins and a necessity to a people whose diet is low in these important substances. But even Daniel couldn't stomach the foul mess until it was further fried out of all possible recognition; until its natural flavor and accumulated odor were killed with the hottest chili sauce she had. I had no great craving for vitamins so I dined on corn-cakes, eggs and coffee. But the eggs had a curious flavor. They had been fried in the same fat as the "vitamins." Because of the occasion, the *cocinera* laid the table with a cloth. The thing was a sorry rag. It had not been washed in months and on its surface was written the story of many a previous meal. As a further distinction, she wiped the only eating utensil she had—a battered tablespoon—upon her greasy apron and handed it to me. I was duly honored by these gestures of her high esteem. I hope I said the proper words. The next morning Daniel and I left Ayutla with many a warm *"Adios"* ringing in our ears.

Beyond Ayutla the mountains become more rugged and the trail climbs upward to another pass. On the sides of the *cañon* out of which we toiled I found the natives planting maize. The line between starvation and survival in these hills is finely drawn. The population is at a standstill, having forced the soil to its ultimate of production. If ten infants are born in a village in any year and only two adults die, eight of the children starve to death. A woman who raises three out of twelve of her children has done marvelously. I have been asked why these people do not move. The answer is easy. *There is no place.* They were driven into these hills by more dominant and warlike tribes, such as the Zapotecs, who have taken all the better lands. The Mihis have dug themselves in on the mountain sides and are literally clinging to the cliffs in their struggle to keep alive. This thing is true, for I saw them planting maize on slopes which my inclinometer said were more than 65° from the horizontal. They plow with oxen where a goat would hardly dare to graze, and where the oxen cannot go, the brush is cut and burned. Then, in the ashes of these fires, they clamber about with long pointed sticks, probing between the rocks for pockets of earth large enough to plant a few maize seeds. The wash of the summer rains takes such a toll on the scanty soil of these badly eroded lands that many of the plots must be "rested" for a period of five to fifteen years, or until the vegetation comes back and a little humus has again accumulated. Such are the agricultural methods of the Mihis.

The *cumbre* held a surprise. As we ascended, various Ericaceae and Vacciniaceae became more common until in the pass, and spilling down over the other side, I found a typical heath-bald, much like those in the Great Smoky Mountains of Tennessee and North Carolina. The dominant shrubs, however, instead of being *Rhododendron* and *Kalmia,* were various species of *Gaultheria.*[2] In the northeastern United States, we are accustomed to think of the checkerberry (*Gaultheria procumbens*) as being representative

[2] *Vaccinium* and *Xolisma* are genera found in the heath-balds of both the Great Smoky Mountains and the territory near Zempoaltepetl, but seldom become a dominant element in this ecological association. Near Tamazulapa, however, on an exceedingly dry and exposed slope, I did find a large area covered mainly by *Xolisma squamulosa,* a species scarcely separable from *X. ferruginea* of our southern states. It is also interesting to note that the heath-balds of both regions are post-climax and probably the result of clearing followed by fire or over-grazing and too, in both areas there are moist- and dry-site types.

". . . Tamazulapa . . . a Mihi town, scattered as are the rest . . ."

of this group. When the genus was described by Linnaeus in 1753 this was the only species recognized. Today more than one hundred are listed, most of which are scattered up and down the mountains in the western parts of the Americas. In general they are taller shrubs, many of them several feet high, and on these slopes I found some up to six and eight feet. Here, they are gracefully arched, glossy, thick-leaved plants with large trusses of flowers—white, pink or red—and pendent masses of blackish-purple fruit, seedy, but honey-sweet.

On the other side of the pass was the village of Tamazulapa. This Mihi town, scattered as are the rest, is perched beside a series of springs on the rim of the *cañon* of the Rio Tlahuitoltepec. From here, I got my first real view of Zempoaltepetl. On the other side of the *cañon,* above the level of Tamazulapa, a sharp-backed ridge winds its way upward to join the main mass of the mountain. We assumed—and later found it to be correct—that the trail to the top of Zempoaltepetl followed somewhat the crest of this ridge. But it was most discouraging to see an enormous yawning chasm stretched between us and our objective. We slid down the steep trail in a cloud of dust, reaching the bottom in about an hour. Since the mules had been going steadily since

morning, it was decided to give them a rest and time to graze on the grass along the river's bank. This afforded a good opportunity to take a bath. It was an invigoratingly cool mountain stream, but the rocks were covered with myriads of leeches. When I came out of the water, I pulled off more than twenty of the thirsty creatures who were already using me for a filling station.

Being refreshed, we tackled the other wall and after about two hours of lung-bursting climbing, came out on the rim and soon found ourselves in the village of Tlahuitoltepec. It was late in the afternoon, but after a little inquiry we learned that there was a *rancho* higher on the mountain and so, deciding to use as much of the daylight as possible, we pushed on, intending to stay there for the night.

We had been told that the Mihi country was full of water and too, that we would have little trouble in getting enough to eat. So, to travel as lightly as possible, we carried neither canteens nor extra food. The water supply was contaminated at Tamazulapa so Daniel and I drank from a pool along the stream in the *cañon,* and here we ate the last of the food which had been prepared by the *cocinera* at Ayutla. I did not like the dribble of water at Tlahuitoltepec, and we continued, assured that we could get both food and water at the *rancho* on the slopes above. In the twilight, we passed more heath-balds where several species of blueberries were common. The trail was becoming narrower and all the while more difficult and we were about ready to stop and spend the night on the first level spot we found. Then just before the darkness closed around us, we came to an open space where a little land had been cultivated and on the other side of it, perched on the edge of a black chasm, was the house we had been hunting; the last *rancho* on the mountain. Inside the place there was a fire, and from around it came sounds of human habitation. Here would be shelter, food, and water. On closer examination, the ranch house proved to be a thatched hut scarcely five feet high at the comb of its low roof and so small that I doubt whether I could have stretched out in it at full length unless I had put one end of me in the fire. I decided to spend the night in the open, not because the place already had three people in it, but rather because, for the time being, I was fairly free from "inhabitants" and in no mood to play the role of host to a lot of little things which might relish the change from a dark-meat diet.

Daniel began bargaining for food.

"Tortillas?"

"We have none."

"Frijoles?"

"We have no beans."

"Well, what do you have to eat?"

"Nada, señor. Nothing, only a little unground maize for ourselves."

"Then give us coffee."

"There is none."

"No coffee? What *do* you have to drink?"

"Only a little water in an *olla.*"

Peering into the jar, I found a turbid fluid in the bottom. I offered fifty *centavos* for a drink and even then was refused. Fifty *centavos* is a fortune to these people so, had there been other water, I am sure they would have given it to me. It was the dry season when water must sometimes be carried miles over steep mountain trails.

Daniel looked at me, shrugged his shoulders and said, "They are poor, *Patrón,* and starving." After a bit of haggling, we bought a handful of dried maize husks for the mules. We then found a level place nearby and rolled up in our blankets. We were tired and a little hungry and very, very thirsty.

One does not sleep well when one's stomach is flat and the juices of one's body have run dry. But there was ample recompense for my wakefulness. Along the trail at dusk I had heard the sleepy twitter of a robin and too, the fluted, spiral notes of the veery, and in the stillness of the velvet night, I listened to the lonesome call of a whip-poor-will. These last two Daniel called the *guilgero* and the *quer-por-wing,* informing me that they were always in the higher mountains. Their notes were not exactly like those I was familiar with, but the songs were unmistakable and took me back to other twilights and to other trails in the Blue Ridge and the Smokies. But the skies were different, for a shoulder of the mountain hid the polar stars I knew. Zempoaltepetl is just seventeen degrees north of the equator, so the CENTAUR rode the mountain tops that night. And I saw the great star ACHENAR, the spring whence flows the meandering constellation ERIDANUS, River of the Sky. There too, was CETUS splashing his broad tail in the silver wetness of a cloud. At midnight, CRUX, the Cross, raised itself out of the mist and stood erect,

a flaming beacon in the skyways of the southern hemisphere. Toward dawn it toppled over and its fire was quenched in a thunderstorm—a storm whose rumblings were not heard but whose lightnings I could see far out where the broad Pacific lay.

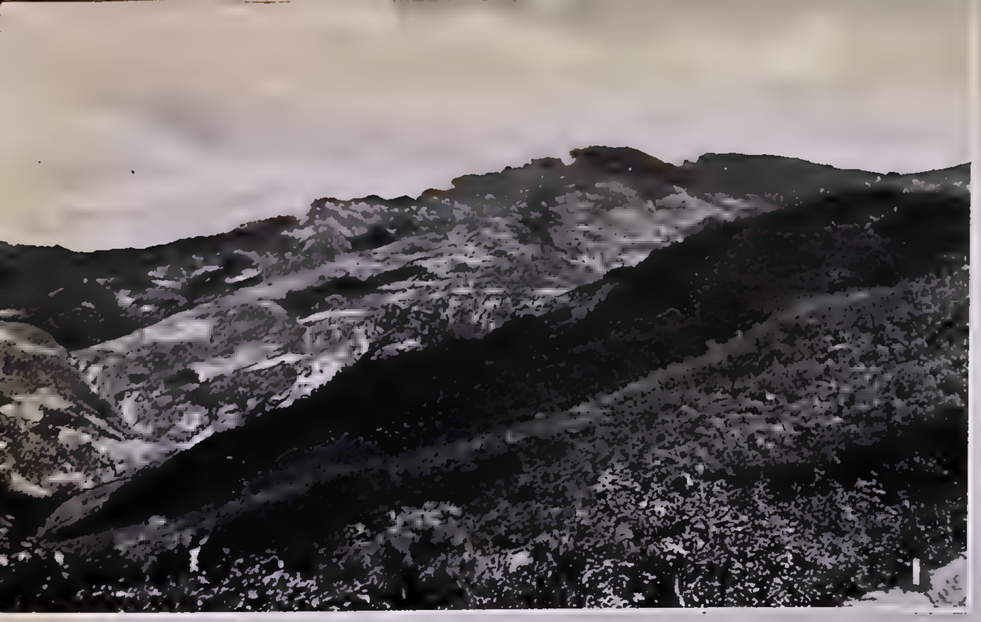
". . . In the pass tall century-plants were in flower. . . ."
Here Daniel climbed into the plant and stood on the upper leaves.

At dawn the mules were loaded. They still were tired and hungry and the way was steep. Most of the plants had passed the height of their flowering season but, on the shady slopes where the moisture had lingered a little longer, some were in bloom. Along the way we sought among the hollows of the rocks and in the dry beds of the streams for water, but the seeking was in vain. Just before noon the trail swung for a short distance along a rocky bench and the mules lifted their noses, testing the air. They quickened their steps and we soon came to a place where sweet water, dripping over a stone, formed a tiny pool. The mules drank deeply, then nibbled of the scant herbage around the margins of this damp spot. Daniel, digging in one of the cargo baskets, let out a shout. He had found a parcel we had forgotten; a piece of bread and two hard-boiled eggs which had been left from the lunch packed at Mitla. They were crushed almost beyond recognition, but they were food. Rummaging in another, I found a small tin of sardines. It was a feast. Then, driving the leg-weary mules over the rocks ahead of us, we came to the *cumbre* which lies between two of the peaks of Zempoaltepetl. Here in the pass tall century-plants (*Agave* sp.) were in flower and we decided to unpack in the shelter of a rock and make camp for the night. Rugged talus slopes, half cliff, towered above us.

There still were several hours of daylight, so we picketed the mules in the pine forest and tackled the nearer heights. As we came to the top of the first rise a strange sight met our eyes. I had heard about an altar on the top of Zempoaltepetl, but was not prepared to find it still in use. The thing was a crude affair, made with irregular stones piled into such a shape that one might suspect that it was a fire place. The entire top of this peak was covered with turkey feathers. There was no evidence of fire ever having been built at the altar, but the place was sprayed with blood. It was the altar where the primitive Mihis perform their ancient ritual of blood sacrifice.

* * *

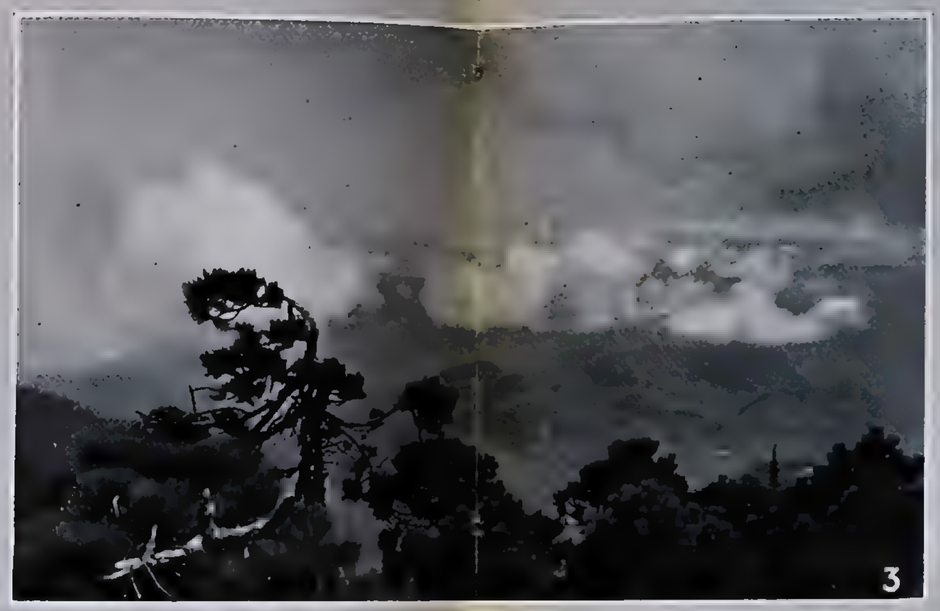
Daniel and I decided that the next morning while I collected he was to go down the other side of the mountain until he came to the first *rancho* and there get food for the mules and ourselves. As soon as it was light enough to see the trail and to distinguish living from dead plants, we were up and at our respective tasks.



IN

THE COUNTRY OF

THE MIHIS



Zempoaltepetl:

1. *The higher peaks hidden in cloud.*
2. *The central and highest peak in a light rain.*
3. *View toward the north from the highest peak.*
4. *Landmark: a solitary palm perched on a rock near San Lorenzo.*
5. *The restaurant at Ayutla, with the cocinera and one of her guests.*
6. *The expedition returns. Near Santa Maria.*

It was after eight o'clock when Daniel returned. He came over to where I was putting some gentians into press and sat down on the ground. The look in his eyes was sufficient. Finally he turned to me and with a weary voice said: "They were poor, *Patrón,* poorer than the others, for they even had no maize leaves for the animals."

It was evident that our stay on Zempoaltepetl would be short and imperative that we make a quick dash to the summit and return to the lower levels as soon as possible, if only to get the weakened mules to a place where they could forage for themselves. We therefore hastily packed the specimens I had already gathered and, putting fresh sheets into the press, started back up the cliff we had climbed the evening before. We crossed the first of the rises and passed the altar. From here a faint trail descended into a saddle and we followed it, only to climb another slope. Again the trail led downward into a gap and then again upward. As we continued, the pine forest through which we had been climbing became more sparse and stunted and each peak higher than the last, until finally we came out on a great promontory jutting into a rolling sea of mist where the ground fell away on every side. There was no higher place in all the south of Mexico. We were on the top of Zempoaltepetl.

There was a momentary break in the clouds and we could see in all directions. Below us lay a great welter of rolling mists and crested mountain peaks. The view to the south was somewhat obscured by haze, but far to the north, a curious line shimmered on the horizon. It was the sun shining on the waters of the Gulf of Mexico. Later we were to learn from one of the men of Ayutla that, had there been no clouds, we would have been able to see both the "northern" and the "southern" oceans. I can well believe that this is true, for there is a gap in the Sierra Madre through which the Pacific Ocean might be visible on clear days. Ours was only a fleeting glance for, as quickly as it had cleared, the clouds rolled in again, blotting out everything but the ground we stood upon.

Even so, there was enough to occupy our eyes, for here on the very top of the backbone of the range which unites the two continents of the western hemisphere, was the main altar of the Mihi tribesmen. The other had been only the subsidiary place of worship. Here was the same crude arc of stones, but larger. Here were the same vessels, but of more intricate design, one

". . . The main altar of the Mihi tribesmen."

The holder for the ceremonial taper and the curious three-holed *copal* (incense) burner, normally beside the altar during the ceremony, have been placed on top for the photograph. On the altar may be seen several hand-rolled native cigarettes and beside it an abandoned basket in which the turkey for a previous sacrifice was transported.

being a most curious three-holed *copal* (incense) burner. All around was a deep carpet of turkey feathers and over the altar were great splotches of blackened blood. Beside the altar I found the holder for the sacred tapers and on it cigarettes and bits of votive offerings. At various places on the top of the great rock I found other evidences of pagan ritual: proofs of recent worship in a religious ceremony of a people more ancient than the Aztecs or the Mayas.

Zempoaltepetl is not so high as the volcanic cones to the north-west and, being closer to the equator, snow seldom falls on its summit. One might, therefore, expect that its top would be covered with a dense forest, but for two reasons the vegetation is sparse. One is that on certain rare occasions there *is* snow and the plants are for a short time frozen. This eliminates certain of the less hardy subtropical species. The main reason, however, lies in the agricultural methods of the Mihis. The fires on the lower slopes of the mountain, made to clear land for maize planting, are set mainly in the dry season and it is no uncommon thing for these conflagrations to sweep over the summit of the mountain. Several days previously, while crossing a pass on the way to

Ayutla, I had seen toward the northwest the smoke of three large forest fires on as many different mountains. There were recent fire scars on the slopes of Zempoaltepetl and ample evidence of this forest scourge on many of the trees near the summit. Here a low shrubby madroño, scarcely two feet in height, was in full bloom and I suspected that it was a new species. Closer examination, however, revealed that the shrubby stems were sprouts from basal portions which showed the scars of ancient fires. These burls were sometimes more than a foot in diameter. One who knows how variable the leaves of an individual of this plant can be, depending on the age of the sprout on which they are borne, might well question the validity of certain of the ten species of this genus in Mexico. This also accounts, in part, for the dozen or more synonyms carried by *Arbutus xalapensis,* the most common and widespread of the Mexican madroños.

But time was passing and so we hurriedly made a survey of the plants available near the altar. The most abundant was a coarse sedum which covered the rocks in the vicinity of the place of sacrifice. The plant was not in bloom but several cuttings were removed and they are now flourishing in propagating beds at The New York Botanical Garden. The specimens probably do not represent a particularly rare species but are interesting mainly because collected from the highest possible altitude in the state of Oaxaca. When we started back to the lower altar I found along the trail one plant which in itself made the whole trip worth while. It was a species of blueberry that had puzzled me for some time, partly because of the fact that it is so rarely collected. The few specimens which I have seen have been poorly annotated, and, on seeing this one my suspicions were confirmed. The species is most closely related to *Vaccinium caespitosum,* the dwarf bilberry, which I have collected in our own Rockies and Sierras and in the Yukon. Its name (*Vaccinium geminiflorum*) takes up almost as much space in print as a full-sized picture would of the plant itself.

While Daniel and I were searching for a few flowering specimens of this rarity, we heard humans coming up the trail. It was a man and his wife on their way to the upper altar, carrying a few parcels and a basket in which was a live rooster. They were too poor to afford the sacred turkey and so they were offering the best they had. Daniel stopped them and talked for a while but they understood so little Spanish and he so little Mihi that the

conversation was brief. Daniel was all for returning so that I could photograph the ceremony, but I declined.

The mountain cloud was swirling around us as we put our plants into press and it was not long before I heard a lusty crowing on the heights above us. Evidently the rooster was doing his best to make the ritual a successful one. Soon there was a gurgled squawk, then silence—and I knew his blood was trickling over the altar of an ancient god. We continued on our way, and as we neared the lower place of sacrifice, we heard voices speaking in the guttural tongue of the Mihis.

The trail swung near, and through the dense mist we could discern two men armed with sharp machetes, holding their sacrificial turkey above the altar while its warm blood spattered over the stones. They were so intent that they did not immediately notice us, but as we approached to within a few yards they paused, looking puzzled and irritated, and glanced at us with impatient faces as though to watch our movements. Beside them were the containers for the sacred food and the specially prepared *mezcal* and *tepache*. They had already imbibed deeply of these potent alcoholics and were approaching a state of religious fervor during which it is well for a stranger not to be around. So after a hasty glance and mental cataloguing of the materials of the ceremony, Daniel and I quietly proceeded on our way. The Mihis, apparently relieved, continued their sacrifice.

I am frankly sorry I have no photographic record of this ceremony, but in my own way of thinking, there has been too little regard for the feelings of primitive peoples and their ancient rites. These men and their families were starving and theirs was a prayer for rain; for rain on the maize; a prayer for life itself. Therefore, had I interfered, violating the sanctity of their Mihi ritual by asking them in Spanish—only Mihi may be spoken at the altar—to hold a long pose while I worked, a panic might have seized them lest their crop should later fail as a consequence. I have seen the explosive anger of these hill men. Even when sober many of them resent being photographed, and their present emotional state was not one to be tampered with. They are quick with their machetes, and one seldom recovers from the wound, for the favorite thrust of these *cerranos* is a curving slash which disembowels the victim. Feeling as I did about intrusion in their ritual, I could scarcely blame them for an attack born of

fear, and I was in no mood to face, either a pair of intoxicated, angered Mihi tribesmen or their resentful friends, aroused in the countryside through which I must return.

The blood of the sacrificial animal as it squirted and dribbled in crimson clots over that pagan altar was to me a thing symbolic: a part of the timelessness of those long-forgotten yesterdays; of hopes lost in the twilight of the past;—of pagan Mexico, stark and still primitive. I think that I am the only outsider ever to witness this ceremony.

W. H. Camp.

A DRY-ROT DISEASE OF OPUNTIA

Among the many interesting plants brought back by members of the Botanical Garden's 1936 Rocky Mountain Expedition were, under their number 76306, a few joints of an unnamed species of *Opuntia,* the prickly pear. These segments were used for propagation. Those in charge of the greenhouse reported that some weeks later a number of black spots appeared on both segments of the plant in one pot. The spots soon increased in size to such an extent that the plant was sent to the laboratory for examination. By this time both segments were entirely covered on one side by a tough black crust-like dry-rot. The segments also showed a few spots on the other side where some of them had already coalesced (Figure 1, above).

From a study of another plant which later also became badly infected it was seen that the spots, if not too far apart, eventually coalesce to cover the entire segment on one side. The excess of drying out and shriveling of the tissues on this side over that of the other side causes the segments to bend over and curve inward (Figure 1, below). The rot does not necessarily extend completely through the fleshy joint.

Each black spot is surrounded by a beautiful brown zone about one sixteenth of an inch wide. Outside of this there is a pale yellowish band of about the same width. The black area of the spot is thickly studded with minute black pycnidia or asexual fructifications of the fungus. It is possible that they represent the so-called male bodies, spermogonia. The bulk of the mycelium

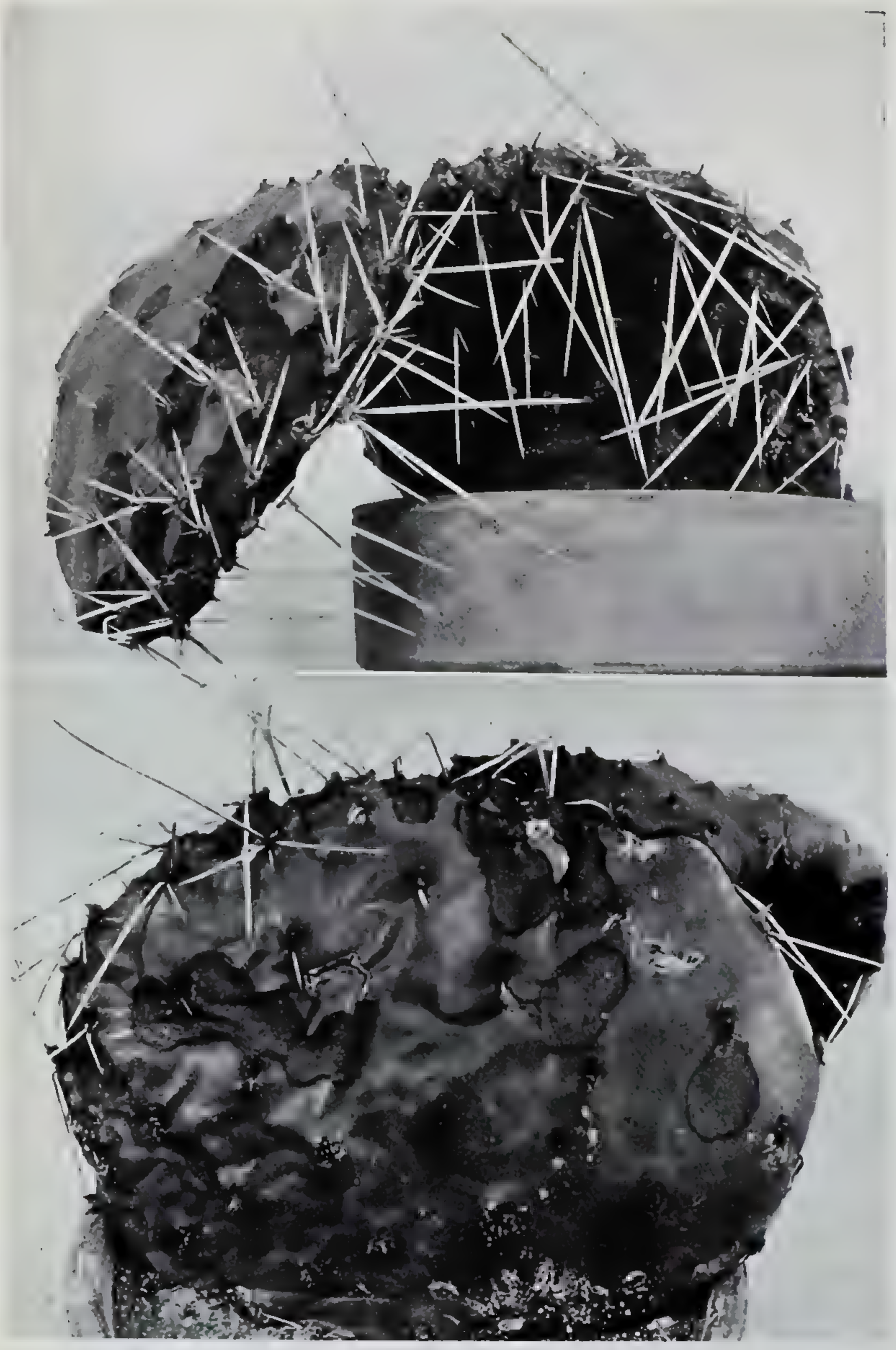


FIG. 1. *Above*: Two joints of an *Opuntia* showing a black dry-rot disease. The "inner" face of both segments was completely destroyed. The drying out and shriveling of this side caused the segments to bend over or curl inward. At the left several isolated spots are seen on the other side, and at one point three or four spots have coalesced. *Below*: The "outer" face of the lower segment of the plant shown above. The brown border zone around a spot is plainly visible, but the pale yellowish outer zone is not clear in the picture.

seems to be located in the epidermis, which it completely destroys so that the fungus appears to be subcuticular. The pale yellowish zone evidently represents the limits of extension of the mycelial hyphae of the parasite, and the brown zone an intermediate stage.

With the finding of the second plant badly infected it was decided to remove all specimens of this variety as a safeguard, although it may well be that the fungus was already present on other varieties in the house, but only became virulent when a more susceptible variety was brought in. Under favorable conditions for its spread the disease can completely destroy plants of this variety from New Mexico.

Dr. Fred J. Seaver has informed me that while collecting botanical specimens in Bermuda with Dr. N. L. Britton and Stewardson Brown, in 1912, they had found a black-spot disease which was very common on *Opuntia* and very destructive. Some years later, 1926, the Australian government sent investigators to the United States in search of insect pests and fungous and bacterial diseases that gave promise of being useful as parasites to check the spread of cacti and brambles which were taking possession of their pasture lands. Mr. H. K. Lewcock, one of the party who had established headquarters at Cornell University, accompanied Dr. Seaver and Professor H. H. Whetzel to Bermuda to study the fungus parasite of *Opuntia* originally collected by Dr. Seaver. Mr. Lewcock took back a quantity of this diseased material to Australia, but owing to a change in policy after he arrived the disease was evidently not tried out.

Dr. J. K. Small informs us that he has seen species of *Opuntia* in Florida badly infected with a rot disease. Dr. F. A. Wolf has also reported one in his studies of four fungous diseases of *Opuntia* in Texas (Ann. Myc. 10:113-134. 1912).

It is interesting to contrast the viewpoints of the botanist, the horticulturist, and the cattleman, regarding diseases of the prickly pear. With whichever side one may sympathize, it is clear that a more thorough knowledge of such diseases is highly desirable. It is hoped that a comparative study of the diseases of the *Opuntia* from Bermuda, Texas and New Mexico will establish more definitely the identity of the fungi concerned in each case.

B. O. Dodge.

REVIEWS OF RECENT BOOKS

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

Gardening, Complete[1]

Centuries have passed since it was written, "Of making many books there is no end, and much study is a weariness of the flesh."

Those of us who started gardening in infancy and will pursue it to the end may be pardoned for some degree of scepticism when we pick up a new gardening book and in a charitable spirit try to ascertain what it has to tell us. Montague Free's "complete guide to garden making" is not merely another book. It has within its pages just what the neophyte in gardening needs to know. It is not simply complete because it has 32 chapters, 550 pages, 73 pictures and more than 100 drawings. Though voluminous it is not a hard book to hold in the hand. It is light in avoirdupois, but heavily freighted with those informative details the beginner needs to know and which are rarely told by those who write books or talk on gardening.

Chapter 1 starts with the selection and planning of the property, and chapter 32 concludes with a month by month summary of *must, may,* and *should* reminders of important details covering the entire year.

In such a space-limited review, this writer cannot even hint at much he would like to commend to the reader's favorable consideration, some of which as to planning and other garden adjuncts may be a matter of personal predilections.

But chapters 2 to 8 embrace the fundamentals of all good gardening. "Read, mark, learn, and inwardly digest them." Then the reward that crowns your efforts and the self-satisfaction you derive therefrom will be in direct ratio to the knowledge you have absorbed and are capable of putting into application.

This reviewer can recall no book where all the essentials of good garden cultivation have been so completely and so understandably set down that even one who never before tried to make Mother Earth produce something for edification, enjoyment, or sustenance, need not fail for want of having at hand information as to what to do and how and when to do it.

Arthur Herrington,
Secretary and Manager,
International Flower Show.

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[1] Free, Montague. Gardening. 550 pages, illustrated, indexed. Harcourt, Brace, New York, 1937. $3.50.

A Non-technical Treatise on Conifers[2]

Hill's Book of Evergreens will find a prominent place on the bookshelf of those whose interests are in coniferous plants. Written by L. L. Kumlien, General Manager of the D. Hill Nursery Company, and published by that firm, the text is admitted by the author to be a compilation of old material rather than an attempt at any new departures. This admission, which has been faithfully carried out, is full warrant for its hearty reception by the gardening public.

The idea behind the book is new only to this country. Beyond all doubt the author and publishers have taken their cue from several now famous publications written in Europe. As a result one cannot help but feel that during its preparation the author referred, not once but many times, to that time-honored volume "Manual of the Coniferae," published almost a half century ago by the nursery firm of Veitch & Son of Surrey, England. If the Hill publication does nothing else, it has made a worthy contribution in bringing a valuable type of European horticultural literature to America.

The book itself will find greatest favor in the hands of the amateur gardener, who will find in the text information on practically every problem which relates to conifers. Soil requirements, fertilization, watering, and pruning are thoroughly discussed in a practical fashion. Detailed and to-the-point instructions on diseases, insect pests, and injuries are also included.

Chapters on the use and adaptation of conifers in ornamental work are well developed and offer sound advice on the proper employment of evergreens. Lists of species are given under groupings arranged according to growth characteristics—a type of information always welcome to the gardener who is not well acquainted with plant materials. Subsequent chapters further develop this data by a series of discussions on foundation plantings, general plantings, evergreen screens and borders, and hedges. Shuffled generously among these sections are related chapters on farm plantings, reforestation, window-box plantings and garden lighting.

One section of the book is valuable for its carefully prepared non-technical descriptions of the various species and varieties of conifers available in this country. Not to be ignored are the cultural remarks concerning the history of each variety which invariably include a statement as to where noteworthy specimens are to be found.

Although sincere and accurate in development of subject matter, the volume warrants one criticism which will not be overlooked by its readers. Offered to the public as a text on the subject of

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[2] Kumlien, L. L. Hill's Book of Evergreens. 304 pages, illustrated in half-tone and in color; indexed. D. Hill Nursery Company, Dundee, Ill. 1936. $3.50.

conifers, there is an undercurrent of salesmanship which is not pleasing to the reader. Several factors make this noticeable, among them the overabundance of photographs illustrating the publisher's merchandise, and the too optimistic discussions contained in such chapters as The Home Nursery and Profits from Christmas Trees.

Profuse with photographs, a fair portion of which are colored, it is a well compiled reference designed, as the author states, "to meet the needs of persons not interested in the botanical or scientific study of evergreens."

A. D. Slavin,
Soil Conservation Service,
U.S.D.A., Des Moines, Iowa.

California Plants[3]

Lester Rowntree has long been known as a collector and earnest student of California plants, and her recent book is filled with authoritative information regarding a large number of species indigenous to that state as she knows them in their native homes. The gardener whose prime interest is in plants rather than in such frills as color schemes, "arrangements" and the like will find this book a welcome addition to his (or her) library and will enjoy exploring its pages in search of information regarding little known but worth-while species. It is a book which will bear reading more than once besides having considerable value as a reference volume.

From the point of view of the eastern gardener, the cultural information offered is decidedly the least valuable part of the book and should not be taken too literally, but as advice of this character occupies only a small fraction of the total pages this is not a serious defect. It is with regret that we in the east must confess that the number of hardy Californians is, for us, extremely limited and no amount of stimulating reading matter from the west or enthusiasm on our part can alter this basic fact.

T. H. Everett.

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[3] Rowntree, Lester. Hardy Californians. 255 pages, illustrated, indexed. Macmillan, New York, 1936. $2.50.

NOTES, NEWS AND COMMENT

Returning late in June from ten days of research work on hardy seedless grapes at Geneva, N. Y., Dr. A. B. Stout reports that the plants under observation at the New York Agricultural Experiment Station there are in excellent condition and that an extra large crop of fruit is promised for the fall. Many new seedlings will be bearing for the first time this year.

* * *

Paul Pfitzer and Walter Heinemann of the firm of Wilhelm Pfitzer of Stuttgart, Germany, were visitors at the Botanical Garden June 28.

* * *

The State Institute of Agriculture at Farmingdale, Long Island, New York, has appointed T. H. Everett as a member of the Advisory Council for its new School of Horticulture which opens next September.

* * *

Continuing his studies on the genus *Helotium,* one of the inoperculate discomycetes, for a monograph preparatory to work for *North American Flora,* W. Lawrence White, a graduate assistant at Cornell University, spent the month of June at The New York Botanical Garden.

Dr. H. M. Fitzpatrick of Cornell also worked several days last month in the mycological herbarium. Among other visitors to the department were Dr. Charles Chupp of Cornell, Dr. Lawrence M. Ames of the Arnold Arboretum, and three Chinese students: C. T. Wei of the University of Nanking, who has been studying at Wisconsin; Lee Ling of Szechuan, who came here directly from the University of Minnesota; and S. Hsieh of Sun Yatsen University, Canton, China.

* * *

The following visiting botanists registered in the library during the spring: Dr. E. D. Merrill, Jamaica Plain, Mass.; Messrs. Reed C. Collins and Alan A. Beetle, Cambridge, Mass.; Professors Alexander W. Evans and Samuel J. Record, Dr. Ernst J. Schreiner, Dr. Francis Drouet and Mr. Theodore T. Ayers, New Haven, Conn.; Mrs. E. P. Gardner, Canandaigua, N. Y.; Prof. L. H. Bailey and Mr. Robert T. Clausen, Ithaca, N. Y.; Professors Erling Dorf and George H. Shull, Princeton, N. J.; Miss Mildred T. Travis, Philadelphia, Pa.; Prof. R. Kent Beattie and Mr. C. V. Morton, Washington, D. C.; Mr. Robert P. St. John, Floral City, Fla.; Dr. Bernard S. Meyer, Columbus, Ohio; Dr. William C. Steere and Mr. Frederick J. Hermann, Ann Arbor, Mich.; Prof. H. E. McMinn, Oakland, Calif.; Mr. A. E. Porsild, Ottawa, Can.; Mr. G. E. Woolliams, Summerland, B. C.; Prof. Kiyoshi Kominami, Tokyo, Japan.

THE NEW YORK BOTANICAL GARDEN

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MEMBERSHIP IN THE GARDEN

Established as a privately endowed institution, aided partially by City appropriations, The New York Botanical Garden is dependent for its progress largely upon benefactions and memberships. Through these means, though young as botanical gardens go, it has become the third largest institution of its kind, its library, herbarium, and horticultural collections ranking among the finest and most complete in any country.

Membership in The New York Botanical Garden, therefore, means promotion of scientific research in botany and the advancement of horticultural interests. Scientifically, the Garden is able to serve as a clearing-house of information for students and botanists all over the world; horticulturally, it often serves as a link between the plant explorer or breeder and the gardening public.

Through memberships and benefactions, provision is made at the Botanical Garden for the training of young scientists and student gardeners; hundreds of new books are added annually to the library, which is open daily to the public for research and reading; free exhibits are maintained in the museum, the greenhouses, and gardens, and lectures, courses, and free information in botany and gardening are given to the public.

Each individual member of the Garden receives:

(1) A copy of the Journal every month.

(2) A copy of Addisonia twice a year, each number illustrated with eight colored plates of unusual plants, accompanied by complete descriptions and other pertinent information.

(3) A share of surplus plant material of interesting or new varieties whenever it is distributed.

(4) Announcements of special floral displays at the Garden from season to season.

(5) Credit, to the extent of the membership fee paid, toward courses of study offered by the Garden.

A limited number of garden clubs are accepted as affiliates. The privileges of affiliation are a subscription to the Journal, announcements of displays, a specially conducted tour of the grounds and greenhouses, and a lecture once a year by a selected member of the staff.

Fellowships or scholarships for practical student-training in horticulture or for botanical research may be established by bequest or other benefaction either in perpetuity or for a definite period.

The classes of membership and types of benefaction are as follows:

Annual Member	annual fee	$ 10
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Fellowship Member	annual fee	100
Member for Life	single contribution	250
Fellow for Life	single contribution	1,000
Patron	single contribution	5,000
Benefactor	single contribution	25,000

Contributions to the Garden may be deducted from taxable incomes. The following is a legally approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ————————.

Conditional bequests may be made with income payable to donor or any designated beneficiary during his or her lifetime.

All requests for further information should be addressed to The New York Botanical Garden, Bronx Park, New York, N. Y.

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CAROL H. WOODWARD, Editor

AUGUST, 1937

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PLANT PATHOLOGY

To select plants judiciously for a particular situation and then provide the right soil and other cultural conditions is only part of the trick—or practice or science—of horticulture. On well-ordered public grounds as in private gardens, pests and diseases are bound to appear. It is the successful prevention or routing of these enemies, with the retarding of their spread to other plants and localities, which often marks the boundary between failure and success in a garden.

The department of plant pathology at The New York Botanical Garden engages in a three-fold program: scientific, horticultural, and educational.

It is through The New York Botanical Garden that numerous valuable scientific facts have been discovered, among them the capacity of different species of fungi to hybridize. This, for instance, offered a new and fundamental clue for the work of breeding plants for disease immunity. Important studies have been made in the sex of fungi. Research is also conducted on the diseases of ornamental plants: roses, hollyhocks, phlox, chrysanthemums, marigolds, prickly-pears, and others, with attention to the sources and methods of infection, so that these may be eradicated.

The greenhouses, trees and shrubs, borders, and other special plantings at the Botanical Garden are kept as nearly disease-free as a consistent program of spraying, dusting, and cleaning can ensure. The work of the department necessarily includes preventive measures against insect pests as well as against the bacterial, fungous, and virus diseases.

Through articles printed in the Journal and in newspapers, magazines, and special bulletins, the public is kept informed of the progress of the Garden's work in plant pathology. Lectures are given and posters are displayed depicting the nature of plant diseases and means of combating them. In addition, countless letters and telephone calls are handled every week, answering people's questions on how to save this or that valued plant from destruction by disease.

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"THE LARGEST FLOWER IN THE WORLD"

The flowering of a specimen of *Amorphophallus titanum* for the first time in the Western Hemisphere on June 8 at The New York Botanical Garden brought to thousands of visitors and to millions of movie-goers a view of what is known as the largest flower in the world and of the largest specimen ever brought into bloom under cultivation. The gigantic aroid also broke another record by remaining in good condition for four days after it opened. Previous specimens which have been raised have collapsed or closed at the most three days after opening.

This was the second attempt at blooming made by this same corm—which apparently means that again it surpassed all other plants of its kind that have ever been cultivated. When the corm was being shipped to the United States from Sumatra in 1932,[1] the plant was dormant, for it was the dry season. But in transit a flower bud started and became fairly well developed, though it was manifestly dwarfed and greatly etiolated, having been trying to grow inside of the crate in the dark. Apparently, just before the corm was delivered at the Botanical Garden, in handling the heavy crate the bud was broken off.

When the first leaf bud appeared above the soil at The New York Botanical Garden a few months later, it was at first thought that a new inflorescence was being produced. By the time three leaves had developed and died over the course of five years, the gardeners and members of the staff had all become skeptics, so that when a fourth bud appeared above the soil on April 10, 1937, the fact that it *might* be an inflorescence this time was barely mentioned. It was therefore not till the bud scales opened enough to reveal the ruffled spathe that a word was spoken aloud about

[1] Jour. N. Y. Bot. Gard. **33**: 155. 1932.

the Amorphophallus. The growth was then (May 26) 3 feet 6 inches in height.[2]

Within a week news photographers had begun their invasion of the tropical aquatic house where the plant was being grown. The daily press kept the public thoroughly informed of the progress of the gigantic bloom, which was increasing an average of four inches in height a day. When the first definite announcement was made that it was opening (about 3 p.m. on June 7), the invasion became a bombardment of the greenhouse, with photographers from half a dozen motion picture companies setting up apparatus on a platform built in the pool and around the margins, camera-men from nearly every newspaper and press service in town as well as from many magazines taking pictures from all angles, and reporters from the major papers and weekly magazines making observations and asking more questions than staff members had heard in all previous years together.

In a steamy temperature of 96 degrees they all worked, the heat of the greenhouse accentuated by the powerful lights of the news-reel photographers. To erect lights in the conservatory, the movie men had to combine all of their long electric cords until they reached to the one electric outlet across the court and beyond, where Lord & Burnham, who courteously gave permission to use their power, were working on the reconstruction of the green-houses.

The plan had been to take continuous motion pictures to show the speed of opening of the spathe of the Amorphophallus. But the first announcement proved to be a false alarm. Reporters, photographers, and members of the Botanical Garden's staff stayed on hand till long after 11 p.m., but the ruffled edges of the spathe scarcely moved another inch. Many of the crew were back

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[2] The total length of the peduncle was 6.6 decimeters, of which 2 dm. were below the surface of the soil. Since the bud-scales, or bracts, were attached to the base of the peduncle, 2 dm. should, therefore, be added to the measured length of these structures to obtain their true length. Several short bud-scales apparently were present below the surface of the ground but these were not measured. The measurements of the visible above-ground portions of the bracts at maturity were as follows:

Bract	Length	Greatest width
First	1.6 dm.	1.5 dm.
Second	4.6 dm.	2.5 dm.
Third	8.0 dm.	2.6 dm.
Fourth	12.1 dm.	3.8 dm.

The spathe reached 12.7 dm. in height, with a marginal circumference (the minor convolutions being ignored) of 40.5 dm.—W. H. Camp.

before 6 of the next morning, some of them having watched the flower at intervals during the night, but if anything the cooled temperature caused the flower to close in a little. By noontime the movie men had all returned and left again, discouraged.

But fifteen minutes after the last of them (the Paramount man) had departed, the spathe again began to pull away from the spadix. The sun burning through the morning's clouds in an hour's time raised the temperature of the greenhouse about 12 degrees, and 8 more degrees shortly after, bringing the atmosphere up to its normal of nearly 96. By the time the staff members had returned from lunch it was evident that the day was at hand for the final opening of the largest "flower" in the world.[3] How long it would last, nobody could predict. The first one to open at Kew Gardens in 1889 had remained for only a few hours. The Kew plant of 1926 had stayed open two days. There were records of practically no others. While ours began to close slightly on the morning of June 9, the spadix remained erect and the spathe fresh-looking three days longer until the spadix suddenly collapsed. Visitors by the hundreds thronged to the Garden day and night, having heard via newspaper, radio, and news-reel that the world's largest flower was to be seen at The New York Botanical Garden.

What they saw when the spathe was open was somewhat the form of a gigantic upturned morning-glory, 4 feet across and nearly 13 in circumference, the rim deeply fluted, the irregular edges ruffled, an enormous tall yellow spadix rising out of its center. This magnificent spathe was lined with deep maroon, which at close range (to be seen only by climbing a ladder and peering inside) seemed to run into the greenish-yellow area which lay below it as though one color had been washed into the other. The dark maroon turned to a deep red as the flower grew older.

Outside, the spathe was light green with irregular spots and occasional other markings of white. Just before opening, the fluted portion turned almost livid in hue. The peduncle, or stalk which bore the spathe and spadix, was a deep bluish-green with many white spots. The yellow of the spadix began to be lightly flushed with purple a few days before the spathe started to open, but this color faded as the inflorescence matured.

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[3] The plant in bloom was regularly referred to as a "flower," even though it is technically an inflorescence.

Those who were privileged to see the individual flowers which were borne around the base of the spadix, and on which several staff scientists worked through a window cut in the wall near the base of the spathe, saw an irregularly compact mass of ivory-colored male flowers beneath a wide bulge in the spadix, and beneath them, against a background of pale olive-green, spiral rows of colorful female flowers, each one a flask-shaped structure composed of a yellowish-orange ovary, a red style shading to carmine, then to a small zone of cobalt violet, and a stigma of dark olive-green capping the style.[4]

These were the actual male and female flowers of the great inflorescence, which is popularly called a flower itself. They correspond to the similar flowers to be found on the spadix of a jack-in-the-pulpit, a calla-lily, or a skunk-cabbage, for the Amorphophallus is a gigantic tropical relative of these familiar plants in the Araceae or Aroid family.

Except for accredited reporters and photographers, and members of the Botanical Garden, the public was permitted to look at the "flower" only from outside the greenhouse—where, as a matter of fact, the view was most advantageous. When the ventilators were opened a trifle at night to keep down the temperature, in an effort to prolong the life of the bloom, enough of the widely publicized stench crept out into the atmosphere to satisfy the curious as to the quality of the smell.

From the time the bud was first recognized as an inflorescence, Miss Fleda Griffith, staff photographer, made daily records of the growth, and when it finally opened, she was on almost constant duty in the greenhouse for several days, recording its aspect from different angles, and assisting in the scientific work which accompanied its blooming by photographing the various parts being studied.

Her work went on, in fact, through the collapse of the spadix, the curious twisting of the spathe, which continued for several days, the collapse of the spathe itself, the digging up of the corm, and the final division of the corm for propagation.

Miss Margaret Sorensen, meanwhile, made paintings in water-color of several stages of the plant and of individual flowers, to be published later in *Addisonia.* A special platform was built for her at the right side of the waterlily pool in the conservatory.

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[4] This color description has been provided by Miss Margaret Sorensen, the artist who painted the plant for the Botanical Garden.

For many days after the plant had drooped and finally been removed, people continued to come to the Garden to see the "world's largest flower." But the best of the show was over the morning of Saturday, June 12, when the spadix toppled forward and the end came increasingly near.

The following day there appeared in the New York Herald Tribune, as a culmination to more than a week of consistent, complete reporting in this paper, a summary of the development and flowering of *Amorphophallus titanum* at The New York Botanical Garden, with a survey of the scientific work being undertaken, written by Lincoln Barnett, one of the Herald Tribune's several staff men who had been covering the event.

CAROL H. WOODWARD.

THE CULTIVATION AND DEVELOPMENT OF AMORPHOPHALLUS TITANUM

The sixty-pound corm of *Amorphophallus titanum,* received from Sumatra in June, 1932,[1] was planted in a large tub immediately upon arrival, and placed in a shaded position in the banana house in Conservatory Range No. 1. In September it was removed to the tropical waterlily house, the tub being placed on a stand with its base a few inches above the water-level in the pool. Here, in a sunny position, a humid atmosphere, and high temperature, the plant made thrifty growth. The first leaf appeared in January, 1933 (Fig. 1), the second in August, 1934, and a third late in 1935. Each leaf was larger than the preceding. The peduncle of the largest exceeded 6 feet in height and the diameter of the spread of the leaf was more than 10 feet.

Between successive leaves a dormant period of a few weeks occurred, during which time water was withheld. The tuber was not removed from the soil, however, and as soon as evidence of growth became apparent again, some of the old surface soil was removed, replaced with a rich top-dressing, and watering was resumed. During periods of active growth generous quantities of water were supplied. By fall, 1936, the tuber had grown too large for its 30-inch square tub, and was replanted in another receptacle 36 inches square and of about the same depth. The estimated weight of the tuber at this time was in excess of 100 pounds. The

[1] Jour. N. Y. Bot. Gard. **33**: 155. 1932.

FIG. 1. The first leaf of the Botanical Garden's specimen of *Amorphophallus titanum,* photographed in 1933. The stem-like petiole stood more than 5 feet high and the spread of the much-divided compound blade was nearly 10 feet. INSET: The bud of the inflorescence taken at 2 p.m. May 26, 1937, just after the sheaths had parted enough to reveal the young spathe inside. The tallest bract measured 3 feet 6 inches in height.

soil used for repotting was a good loam enriched with liberal amounts of cow-manure and bone-meal. The tuber was set on a cushion of clean sharp sand with the top two or three inches below the surface.

The first signs of growth after retubbing were noticed on April 10 of the present year, and by May 26 the growth had attained a height of 3 feet 6 inches. Subsequent development, as

recorded by Mr. Patrick Connolly, foreman in Conservatory Range I, was as follows:

HEIGHT OF TOP OF SPADIX FROM SOIL LEVEL

10 a.m.	May 27	3′ 6″
10 a.m.	May 28	4′ 2″
10 a.m.	May 29	4′ 6″
10 a.m.	May 30	5′ 0″
10 a.m.	May 31	5′ 7″
10 a.m.	June 1	6′ 1″
10 a.m.	June 2	6′ 8″
10 a.m.	June 3	7′ 0″
10 a.m.	June 4	7′ 5″
10 a.m.	June 5	7′ 8″
10 a.m.	June 6	8′ 0″
10 a.m.	June 7	8′ 4″
10 a.m.	June 8	8′ 5″

CIRCUMFERENCE AT WIDEST PART OF UNOPENED SPATHE

10 a.m.	June 4	4′ 4″
10 a.m.	June 5	4′ 6″
10 a.m.	June 7	4′ 10″
9 p.m.	June 7	5′ 0″

At 2:30 p.m. on June 7 a small slit about three inches long appeared in the spadix, and a second slit developed about half an hour later, the slits gradually increasing in length until on the morning of the following day they reached from the tip of the spadix well down below the top of the spathe. The actual opening of the "flower" meanwhile had begun. At about 3:15 p.m. on June 7, the rim of the spathe commenced to pull away from the spadix. The temperature in the house at that time was 94 degrees The spathe continued gradually to expand until 9 p.m., by which time the temperature had dropped to 70 degrees, where it remained until morning. During the night the spathe closed in a little. The morning was cool and cloudy until about 11 a.m. when the sun appeared and the temperature within the greenhouse commenced to rise. By 1 p.m. it had reached 90 degrees, and the spathe again began to expand. At 4 p.m. the temperature reached a high of 96 degrees, and development of the opening inflorescence continued rapidly until 7:40 p.m., when it reached its maximum. Measurements taken at that time were as follows:

Height of spadix above soil	8′ 5″
Greatest maximum spread of spathe	4′ 1½″
Circumference of the rim of spathe	12′ 10″
Length of spathe	4′ 1½″
Height of peduncle	18″
Circumference of peduncle	18″

While at the height of its development a distinctly unpleasant odor was emitted by the plant, but this in no way compared with

the disgusting stench of the plant which flowered at Kew in 1926. At 9:15 on the evening of the eighth the temperature in the greenhouse was reduced to 70 degrees and was maintained at this level through the night and part of the next day.

The inflorescence remained in good condition until June 12 and little change was noticed in its general appearance except that the spathe gradually closed inward and upward, so that its rim was raised from a height of 3 feet 2 inches to 4 feet 10 inches above ground level. On the morning of the twelfth the spadix collapsed in a forward direction without doing any material damage to the spathe, which continued to close and twisted itself together at the top in corkscrew fashion until it was completely closed. From this time on the plant slowly diminished in size. On June 29 it was

FIG. 2. The 113½-pound corm of *Amorphophallus titanum,* removed from the soil at the end of June, after its gigantic inflorescence had withered and decayed. Around the crown from which the peduncle had arisen, several incipient leaf-buds may be seen. The roots grow out from an area immediately surrounding this central ring. The small white structures (cormlets) which nearly cover parts of the corm, are outgrowths from the parent body and all, apparently, are potential new plants. When the corm was divided for propagation, a number of these as well as at least one leaf-bud were included in each section.

removed from the tub. The tuber (Fig. 2), which had begun to rot, then weighed 113½ pounds. It measured 6 feet in circumference, at its widest part it was 2 feet 2 inches in diameter, and 1 foot thick. A large portion of its surface was covered with tiny adventitious buds and as it showed marked evidences of rotting it was decided to cut the tuber into portions and attempt to propagate it vegetatively.

T. H. Everett.

FROM TROPICAL MOUNTAIN SLOPE TO NORTHERN CONSERVATORY

The steamy tropical atmosphere of the mountain slopes of Sumatra is the situation where *Amorphophallus titanum* is found in the wild. Nowhere else in the world does this "bulky vegetable," as an early writer once described it, grow in nature. It was discovered there less than sixty years ago by an Italian explorer and botanist, Dr. Odoardo Beccari, who at once described it as the "giant among flowers." (More correctly, it is an inflorescence, not a flower, but even as such it retains its place as the largest of all.) Curiously, the largest true flower in the world, *Rafflesia Arnoldi,* whose perianth often attains a diameter of three feet, also finds its home in Sumatra, in the jungles. Dr. Beccari saw the two plants close enough together to be able to make comparisons between them.

According to one of his reports, the natives refer to *Amorphophallus titanum* as "krubi," "grubi," or "krubut," names which are used there, he says, for other aroids as well.

Dr. Beccari first saw the leaves of this plant at Ajer Mantcior, Padang Province, Sumatra, on August 6, 1878. Shortly after, at Kajù Tanam, nearby, he learned that it was common in the hills around, so he offered a large reward for a flower. On September 5 it arrived, lashed to a pole and carried on the shoulders of two men. This scene was reproduced beneath a life-size drawing of a plant in leaf, which his patron, the Marchese Corsi-Salviati of Florence, had made under Beccari's direction. A copy was presented to the Royal Botanic Gardens at Kew, England, and placed on the ceiling of the large hall devoted to the timber collection.

As soon as the plant was discovered, an attempt was made to

send tubers[1] and seeds to Italy to be grown in the Marchese's conservatories.

"The tuber of a plant that I dug up," wrote Dr. Beccari, "is . . . nearly 5 feet in circumference. Two men could hardly carry it; they fell down, and the tuber was broken. I will secure some more, and I hope to be able to forward them to Florence in good state. Meanwhile, I send you some seeds."

The corms which he eventually sent were detained so long in quarantine at Marseilles that they rotted. But of the seeds the Marchese received it was confidently reported: "Many have germinated, so that the species is secured to European collections."

Little did anyone think that the only seedling to live would be one of those which Beccari had asked to have sent to Kew. Ten years later, 1889, there came into bloom at Kew Gardens the first specimen of *Amorphophallus titanum* which had ever been seen in cultivation outside of the tropics. It towered to 6 feet 9 inches in total height and opened to a diameter of 4 feet. While the corm had weighed 57 pounds before the flowering, it lost 9 pounds during this vital period. The following year it produced another leaf, a bit smaller than the previous ones, but showed no further sign of life after this leaf died down.

Each specimen of *Amorphophallus titanum* which has since been flowered in cultivation has been grown from a new corm imported directly from Sumatra. Two small inflorescences appeared at Kew: 1901 and 1929, but few records were kept of these. The important Kew plant of the present century bloomed in August, 1926, and though it reached 1 foot less in height than the 1889 specimen, it lasted two days instead of only a few hours.

In Calcutta a plant was raised which flowered in March, 1882. At the Botanical Garden of Buitenzorg, Java, a splendid specimen was brought into bloom outdoors in June, 1924. The behavior of this plant, as it came into flower, was surprisingly like that of the specimen at The New York Botanical Garden, even to the splitting of the spadix shortly before the spathe opened. In the illustration which appeared in the Gardeners' Chronicle for November 1, 1924, it appears to be the giant of them all, for a Javanese boy who is standing beside it reaches scarcely two-thirds of the way to the top. But when the centimeters are translated into

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[1] Although technically a corm, the basal portion of the plant has frequently been referred to as a tuber.

inches, it is found that the Javanese specimen was exactly 6 feet high.

In 1929 and 1930, two of the three corms acquired in 1927 by the Botanical Garden in Hamburg, Germany, came into bloom and excited much attention.[2] Though they remained in good condition about as long as the New York inflorescence, neither of them quite reached a height of six feet. This leaves the New York specimen, which was acquired through the efforts of Dr. E. D. Merrill when he was Director, to take the record as the largest known in cultivation. It stood 8½ feet high.

Ten days before ours opened, Dr. Hans Schäfer of Lebong Tandai, Sumatra, visited the Botanical Garden just before sailing from New York for his former home in Görlitz, Germany. He told about the specimen in Hamburg, and how a cordon of police was required outside the conservatory to keep the crowds of visitors in line. He had seen many examples of *Amorphophallus titanum* also in the wild, he said, and showed several staff members photographs of them. Having come up to the Garden especially to see the specimen here, he predicted to within a day of the time of its opening. At the time, those who had been watching the plant day after day expected that it would come into flower much sooner. Dr. Schäfer told also of other species of *Amorphophallus* with which he was familiar in Sumatra, and left as a memento a photograph he had taken of the long-peduncled *A. Brooksii,* which measured 3½ meters (11½ feet) in height, having grown to that size in 28 days.

Amorphophallus gigas is also a native of Sumatra, but it can not compare in size with *A. titanum,* for while it has a peduncle 6½ feet long, the spadix which stands in the center of the spathe is only 3¼ feet tall. Of greater dimensions is *Godwinia gigas* of Nicaragua, another aroid of similar habit, but not quite equal to *Amorphophallus* for height and bulk. In fact, it is said that *A. titanum* surpasses all other plants in the world, not only in size of inflorescence, but also in the rapidity of the development of tissue in a single leaf. Not even the bananas, it has been declared, can push forth so much new green tissue in a given time.

CAROL H. WOODWARD.

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[2] For a complete description and record of growth of these two plants, see Hans Winkler in Berichte der deutschen botanischen Gesellschaft 49: 87-102. T.VI.-IX. 1931.

3 *p.m. May 27*
The greenish spathe first showing.

10 *a.m. May 28*
The tip of the yellow spadix appears.

10 *a.m. June 1*
Already 6 feet high.

10 *a.m. June 7*
In 6 days developed from 6 feet to 8 feet in height.

4:30 *p.m. June 8*
A view from the front.
It took only 3 hours for the spathe to open this far from the spadix.

June 9
The morning after the spathe had reached its full development.

June 11
The spathe beginning to close.

AMORPHOPHALLUS TITANUM

The story of its inflorescence as revealed by the camera of Miss Fleda Griffith, staff photographer. The pictures above show the development of the "flower" from the time the bud scales first parted and exposed the ruffled green spathe (the whole structure then stood 3½ feet high) until it reached its maximum development less than two weeks later at a height of 8½ feet. The handsome maroon-lined spathe then was open to its full extent while the individual flowers hidden at the base of the spadix approached their maturity. Below, the inflorescence is shown from the front, first three days after opening, as the spathe began to close; then with the spadix collapsed forward, and finally with the spathe twisting spirally, forming the chamber in which the seeds would normally develop.

11:30 *a.m. June 12*
Immediately after the spadix had collapsed.

June 15
The ribbed margin of the spathe twisting spirally and forming a closed chamber.

NOTES ON THE PHYSIOLOGY AND MORPHOLOGY OF AMORPHOPHALLUS TITANUM

When the Botanical Garden's specimen of *Amorphophallus titanum* had reached a stage at which it was thought that the individual flowers borne at the base of the spadix would be mature, preparations were made for scientific study of the floral as well as the vegetative parts of the great inflorescence.

The writer, accordingly, on the morning of June 9, cut an oval window 5 x 6.5 centimeters in the wall of the spathe approximately 15 cm. from its base. At this point the wall was 3.2 cm. in thickness. Beyond it could be seen the basal portion of the spadix bearing the male and female flowers.

FLORAL MEASUREMENTS

When the window on June 10 was extended basally to the junction of the spathe with the peduncle and enlarged to a size of 10 x 23 cm. (Fig. 3), in order to facilitate the making of observations, taking of measurements[1], and the removal of parts for future study, it was found that the male flowers occupied a zone around the spadix 8 cm. in height, while the female flowers occupied 15 cm. beneath them. At the line where the two zones met, the spadix was 49 cm. in circumference. Immediately above the area of the male flowers, the sterile portion of the spadix bulged to a circumference of 96 cm. At the base of the region of the female flowers, the circumference of the spadix was 64 cm. The peduncle was 46 cm. around.

By carefully marking off segments of the floral zones and counting the number of flowers on several different radii, in con-

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[1] A comparison of certain measurements for this species as given in Engler (Pflanzenreich **IV. 23C**: 86-87. 1911) with those of our plant is as follows:

	From Engler	Our plant
Diameter of corm	5 dm. (as maximum)	6.4 dm.
Length of peduncle	5-10 dm.	6.6 dm.
Breadth of peduncle	0.8-1 dm.	1.46 dm.
Length of spathe	7-8 dm.	12.7 dm.
Length of female inflorescence	1.3 dm.	1.5 dm.
Length of male inflorescence	0.6 dm.	0.8 dm.
Length of sterile portion of spadix	1.5 m.	1.86 m.
Length of "stamens" (male flowers)	2 mm.	4.5-5 mm.
Breadth and thickness of "stamens"	2-2.5 mm.	2-2.5 mm. x 3.5-4 mm.
Length of ovaries (on female flowers)	5 mm.	6-8 mm.
Length of styles	10-12 mm.	18-22 mm.

FIG. 3. The flower-bearing portion of the spadix of *Amorphophallus titanum,* as seen through a window 10 x 23 cm. cut near the base of the spathe. The approximately 4,800 ivory-colored male flowers which were closely massed beneath a wide bulge in the column exuded chains of yellow pollen which fell on the stigmas and ovaries of the 700 female flowers below.

junction with the above measurements, it was calculated that the spadix bore approximately 700 female and 4,800 male flowers. No true hermaphroditic or bisexual flowers were found, although two dwarfed female flowers were discovered among the males near the juncture of the two zones.

PROTECTION FROM RAIN

During the maximum opening of the spathe, the writer wondered what would happen under natural conditions during a jungle rain, for the overlap of the free margins of the spathe seemed so effectively closed that it appeared that water would drain out of the structure only with difficulty. When the larger window was made in the spathe, it was found that the attachment of the spathe to the spadix was about three centimeters higher on the side opposite the place where the spathe margins joined than its lowest point, which was at the lower margin of the inner lip. Any water, therefore, drained to this point. Viewed from the inside, the lateral margins of the spathe were overlapped and tightly appressed to each other throughout their entire length except at the base where the spathe was attached to the peduncle and where the marginal overlap was greatest. Here at the base there was a small channel slightly less than 1 cm. in width which led the water between the overlapped margins of the spathe to the outside. Water poured into the spathe-bell immediately ran out through this channel.

After the spadix had toppled, the morning of June 12, the spiral twisting of the distal margin of the spathe, which continued for several days, effectively closed the chamber in which the seeds would have developed and made it apparently rain-tight (Fig. 4).

ACTION OF DECAY ORGANISMS

There was a certain amount of concern lest the incisions made in the spadix during the removal of the flowers might give access to decay organisms and cause the rapid disintegration of the whole structure. On June 12 it was noted that a small amount of a blue mold was forming where a few male flowers had been removed on the tenth. In the next several days this condition cleared up, the growth of the mold seemingly having been inhibited. At no time on the larger areas removed on the eleventh and twelfth was there any evidence of decay. After the final collapse of the structure it was obvious that the decay organisms, which were

then attacking the spadix and flowers, had entered from the top by way of the collapsed spadix or through the stylar regions of the female flowers, for it was on the stigmatic surfaces of these structures that the first real decay was noted on the fifteenth. In fact, when last examined on the twenty-ninth of June, the only female flowers which were not completely decayed were in the immediate region of the observation window and the places where specimens had been taken. Apparently the lower portion of the spadix of this plant contains some substance which normally inhibits the development of micro-organisms. Studies by the writer on the reactions of other Araceae, such as various species of *Monstera, Alocasia* and *Arisaema,* gave strong evidences of this for, without fertilization, the floral axes of the species studied soon underwent physiological breakdown and subsequent decay. However, if fertilization of only a fair percentage of the flowers took place, no decay of the structure bearing the developing fruits was

W. H. Camp.

FIG. 4. The manner of spiral twisting of the spathe of *A. titanum* is shown at the left as it appeared about a week after the spadix had collapsed. At the right the inflorescence is shown shrunken to only a fraction of its former size and nearly ready for its own final collapse. Two days later the decayed remains were cleaned away and the corm was removed from the tub.

evident although the organisms of decay were present and abundant in the collapsed portions of the spadix and adjacent spathe. This, in spite of the total absence of the formation of an isolating abscission layer or periderm. It may, therefore, be safe to assume that fertilization did not take place in our specimen. Recent notes on *Amorphophallus variabilis, A. oncophyllus, A. titanum* and *A. campanulatus* (particularly the first two) by Van der Pijl[2] in Java, indicate that certain species of this genus are self-sterile.

By June 29 it was obvious that no seed had been set, and since both spathe and spadix had completely collapsed it was decided to examine the remains of the corm. Much to our surprise, it showed but little deterioration after having produced so gigantic a bloom. Soft spots where the tissues had undergone a certain amount of physiological breakdown and decay were noted at various places on its surface. The presence also of deeply eroded pits, well healed and lined with a healthy layer of periderm, were evidence that this type of malady was not a new thing in the life of the plant. Though the corm had been previously injured, it had apparently recovered.

Instead of being perfectly rounded, the corm was found to have a basal outgrowth of somewhat smaller dimensions. This is not an abnormality, but seems to be a fairly well defined specific character. The roots, as is usual with typical corms, were borne at the top and on (or rarely adjacent to) the basal parts of the leaf-bearing portion of the central axis.

Already two large and about ten small leaf-buds were showing on the crown of the corm. The most remarkable thing, however, was the several thousand small buds present in large areas on the surface of the corm. Sections revealed that they were outgrowths of the pericycle, a natural generative layer lying about one centimeter beneath the surface. Each of these buds was a potential new plant and there is no known reason why, if removed from the physiological dominance of the parent corm, each would not develop and eventually become an individual plant. For the peace of mind of gardeners everywhere, however, let it be said that the mortality of these cormlets must be extremely high, as no

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[2] Biological and physiological observations on the inflorescence of Amorphophallus. L. Van der Pijl. Rec. trav. bot. néerl. **34-1**: 157-167. 1937.

FIG. 5. A web-like tissue was revealed in the interior when the spadix of the gigantic aroid split. The thin-walled rind of the spadix was found to be the source of the nauseous odor of the plant. This photograph, which was taken after the "flower" had begun to close, shows well the texture and fluting of the margin of the spathe.

authentic record is known of their ever having been successfully propagated in this species.

THE ODOR OF THE INFLORESCENCE

It has been mentioned elsewhere that the odor of our bloom was not so pronounced as that recorded for other plants. It surely was not so malodorous as intimated by the accounts in the press, but nevertheless was of sufficient strength to enable certain observations to be made. During the height of the flowering period the writer was almost continuously with the plant and

conversed with several organic chemists, particularly Mr. Raoul Nadeau, who visited it at that time.

It is certain that the odor was not continuous but came in waves of varying intensity. At the periods of greatest intensity, the writer wiped the surfaces of the flowers, spadix, and spathe with cotton swabs. These were removed from the immediate vicinity of the plant for testing, but at no time could any odor be detected on them as the result of noxious secretions. The various exudates from the cut surfaces of the spathe and fertile portion of the spadix, as well as the pieces removed from these structures for study, also were examined, with negative results.

The several slits which were noted in the spadix wall on June 7, prior to the opening of the spathe, enlarged on subsequent days and in addition others appeared. Through these openings it was easily ascertained that the spadix was not a solid structure, but consisted of a thin rind 2—2.5 mm. in thickness, enclosing a spider-webby mass of collapsed parenchymatous tissue adhering to an anastomosing system of vascular bundles of great complexity (Fig. 5). This last tissue had practically no odor. It was found, however, that the stench came from the tissues of the thin-walled rind of the spadix.

The odor emitted by the spadix wall was variable both in its intensity and quality, indicating that no simple chemical reactions were responsible for its formation. It is highly probable that the source of the odor may be found in the offensive amino-aldehydes such as β indole propionic acid, indole acetic acid, skatole, and indole. The highly diffusable nature of the odor is undoubtedly due to certain unsaturated aliphatic aldehydes such as acrolein, crotonaldehyde, and related compounds. These unsaturated aldehydes are extremely pungent and might easily act as carriers for the more offensive amino-aldehydes. The writer noted that various visitors during the periods of maximum odor were continuously blinking their eyes, and, personally, noticed a burning sensation of his own eyes which might easily indicate that certain triple-bond unsaturated aldehydes, known to be lachrymators, were also present.

It is suggested that future work on the odor of this plant should definitely ascertain whether or not some amino-acid is found in the outer tissues of the spadix which would give rise to the suspected skatolic and indolic derivatives which in turn would be carried by

the unsaturated aliphatic aldehydes, which undoubtedly were present. Butyric aldehyde, at least, was certainly detected.

The hypodermis of the spadix rind was a compact tissue and its epidermis covered with a fairly thick layer of cutin. These would, under ordinary conditions, tend to cut down gaseous exchange of this organ with the outside. The various large slits in the spadix of our plant, however, permitted free access of air to its interior, and since the majority of the various substances suspected as the source of the odor are easily oxidized to less- or non-odorous compounds, it is thought that the extreme odor possible chemically never was attained by our specimen simply because the malodorous substances were oxidized so rapidly that their concentration in the tissues of the spadix was less than that normally to be expected.

W. H. Camp.

SOME OBSERVATIONS ON FLOWER BEHAVIOR IN AMORPHOPHALLUS TITANUM

Observations on the flowers of the Botanical Garden's plant of *Amorphophallus titanum,* which came into bloom on June 8, were made through a hole which was cut in the spathe of the inflorescence the following day. Portions of the flowering parts were also removed from the region of the hole for study in the laboratory.

POLLEN SHEDDING

On the afternoon of June 9, after the hole had been cut in the spathe, the pistils appeared to be receptive although no pollen was yet being shed. This condition, which is frequent among plants, is technically known as protogeny.

The next day at 8 a.m., slender threads of pollen, some of them as long as a centimeter, were being extruded from the two apical openings in the anthers. Some had already dropped, either as entire threads or as rod-shaped segments, and while a few were lying on the stigmas of the female flowers below, most of them were lying on the ovaries. The pollen was not abundant and nowhere was it floating in the air.

A small amount of pollen was obtained for study by gently touching the end of a slender-pointed glass rod to the tips of the

anthers, then scraping the inner edge of a gelatine capsule along the rod, capping the capsule, and taking it at once to the laboratory. The few pollen threads which were left on the rod and exposed to the air soon dried out and shriveled and apparently broke up into segments.

MICROSCOPIC STUDY

Examination of the fresh threads, mounted in 10 percent glycerine and placed under the microscope, revealed that they were composed of relatively few normal pollen grains interspersed among many aborted grains which adhered to each other as if they were coated with some mucilaginous material. The grains were not embedded in a matrix; there was only a capillary film which extended between grains that were close together. The small

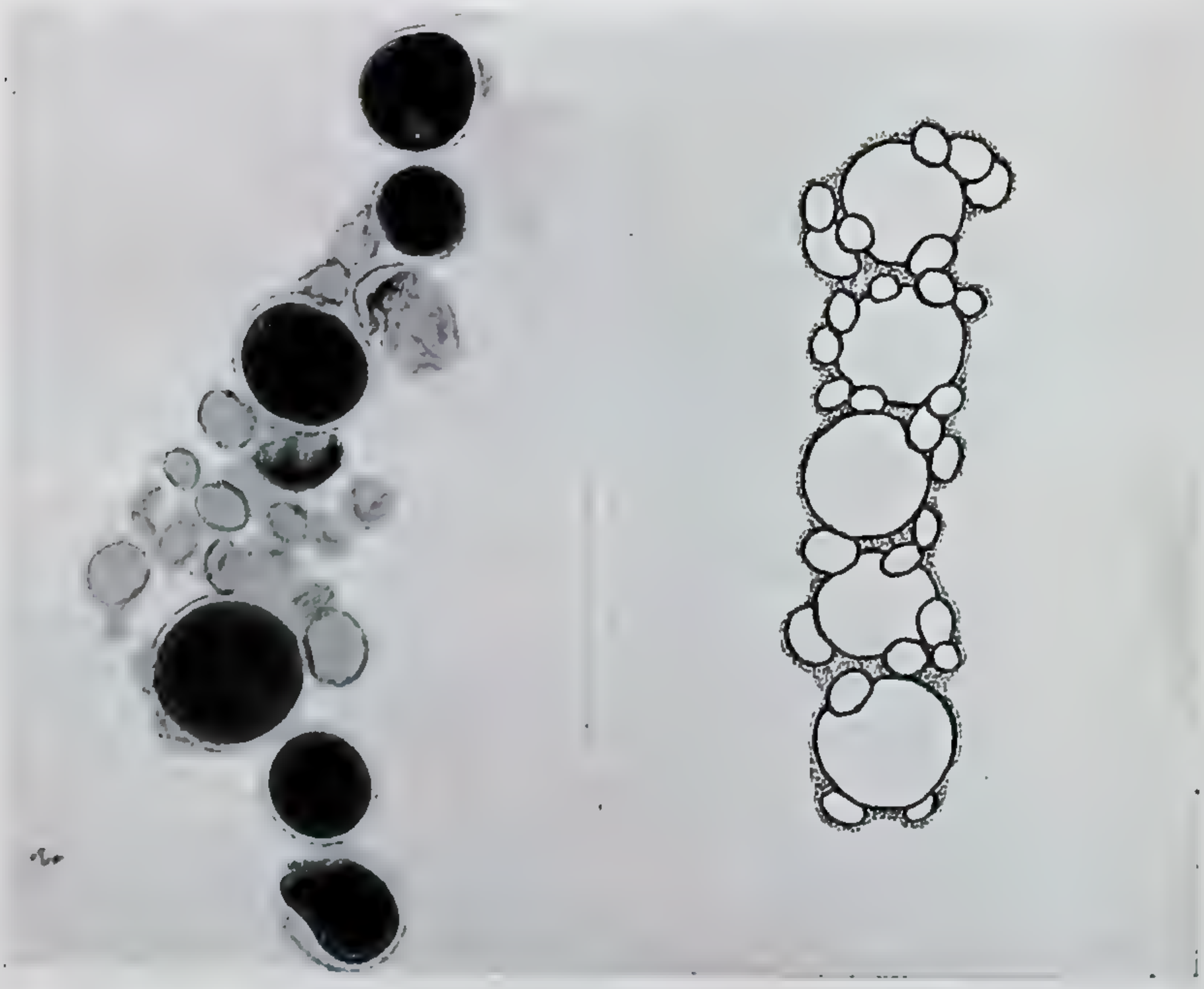

FIG. 6. *At left*: Photomicrograph of pollen of *Amorphophallus titanum* (x 120). Variation in size is noticeable in the large, full grains as well as in the aborted grains, a few of which show some contents. The thin film of adhesive substance which holds the grains together in chains is somewhat granular. *At right*: A camera lucida drawing of part of a characteristic pollen chain of *A. titanum* (x 120), showing the linear arrangement of the grains.

aborted grains were mostly empty, though in some a yellowish granular material was present. While many of them were spherical, some were more or less collapsed.

The grains judged to be normal were spherical and filled with protoplasm. There was considerable variation in their size, the measurements showing a range in diameter from 110 to 150 μ. The aborted grains varied from 30 to 70 μ in diameter.

Counts which were made of all of the grains in fourteen entire segments of pollen threads selected at random showed that nearly 88 percent of all the pollen grains were aborted. That is, of the 591 grains counted, 519 were aborted and empty.

ARTIFICIAL GERMINATION

Germination of pollen on artificial media was attempted. Pollen which had been collected on the morning of June 10 and kept in a gelatine capsule for about two hours was placed on media made with 1 gram agar to 100 cubic centimeters of water, to which 5, 10, and 15 grams of cane sugar were added. The cultures were placed in a moist chamber and kept at room temperature. After 24 hours there were no changes in the appearance of the pollen except that one grain had germinated and a short pollen tube had formed. Another culture, which was kept at 95° F. over night and then at room temperature for a time, showed three pollen tubes about 900 μ in length. The ends of the tubes were somewhat swollen. The very low percentage of germination obtained in these tests for pollen which appeared to be normal probably indicates that the methods or the media used were not adequate.

OBSERVATIONS ON THE POLLEN

Some of the cultures of the germination tests were stained with aceto-carmine, with lacmoid, and with cotton-blue and semi-permanent preparations were made. No pores were observed in the pollen grains. The outer layer or exine was thin, while the inner layer or intine was relatively thick in both normal and aborted grains. The exterior of the grains was smooth except that after the staining the film about the grains seemed to be somewhat granular and irregular in thickness. The stain revealed in the pollen tubes the two sperm nuclei near the apex and the vegetative nucleus slightly more removed from the tip of the tube.

At the time the pollen was collected on June 10, a few pistils which showed pollen on their stigmas were carefully removed. The basal ends of these pistils were set in water and placed in a moist chamber. The next day examination showed that at least some of the normal pollen had germinated on the stigmas. But the tubes were short. One tube was folded or doubled on itself; one was arched in a loop that extended above the surface of the stigma; one tube extended into the air and thus held the pollen grain in the air. Careful dissection and staining of the inner tissues of the stigmas and styles showed that the pollen tubes did not extend into the conducting tissues. They remained on the surface or with the tips penetrating only a short distance into the layer of papillae. As the ends of the tubes could not be seen, it was concluded that they had burst. This behavior of pollen tubes on the stigma is characteristic of various cases of self-incompatibility. Possibly incompatibilities operate in the species and cross-pollination between different self-incompatible individuals which are cross-compatible is necessary for the formation of seeds. Although there appears to be some degree of protogeny in the one plant studied, the shedding of pollen soon follows and some pollen naturally drops onto many of the stigmas which are still apparently receptive. If a plant produces no seed this is further evidence of self incompatibility.

The pollen of certain other members of the Aroid family is also expelled from anthers in slender threads. This can readily be observed in the common calla-lily, but in the cases examined by us there was no abortion of pollen. It would hence appear that the abortion of pollen observed in this plant of *Amorphophallus titanum* may not be necessary for the formation of the mucilaginous material which holds the pollen together during the extension and for a time thereafter.

In the observations reported above the writer has been assisted by Dr. W. M. Porterfield, who made microscopic studies of pollen threads and made the tests for germination of pollen, and by Miss Clyde Chandler, who made the studies of pollen-tube behavior on pistils and took the photomicrographs here reproduced.

A. B. Stout

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* * *

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To reach the Garden by the Elevated and Subway systems, take the Third Avenue Elevated to the end of the line (Bronx Park Station); from the East and West Side subways, transfer from the Lexington or Seventh Avenue line to the Third Avenue Elevated at 149th Street and Third Avenue. By Eighth Avenue subway (Independent system) take a C or CC train to Bedford Park Boulevard (200th Street), then walk east to the Garden.

To come by motor from the city, drive north on Grand Concourse to Bedford Park Boulevard (200th Street), turn east there, and cross the railroad bridge into the Garden grounds.

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

SEPTEMBER, 1937

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THE MUSEUM BUILDING

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Microscopes such as scientists have used in the past 250 years in discovering hitherto unknown facts in the lives of plants comprise an important historic display.

On the main floor there are 10,000 exhibits of economic plants—food products, drugs and medicines, poisons, gums, resins, starches, sugars, oils, fibers, and others—all described in a printed guide. Also on the main floor are 760 examples of native and introduced plants which grow wild within 100 miles of New York. For this exhibit herbarium specimens such as all botanists use for their studies are shown.

Fossils which reveal the plant life of the world from millions of years ago down to the Ice Age are displayed in cases in the basement of the Museum Building. There also can be seen a cross-section of the trunk of one of the greatest living trees of the present age, *Sequoia gigantea*, the Big Tree of California. This tree sprouted from its seed in 223 A.D. When Columbus discovered America it was 8 feet in diameter, and when it fell in 1917 the trunk measured 10 feet from side to side and 33 feet in circumference. It was then 1,694 years old.

While visitors daily are studying the many museum displays, in the same building staff members are pursuing, in offices, laboratories, the library and herbarium, the administrative and scientific work through which the institution functions in the service of science and the public.

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THE BEEFSTEAK MUSHROOM

A scattered army of mushroom collectors awaits the coming each year of the beefsteak fungus, which is a fleshy mushroom common in North America and Europe, unmistakable, and safely edible. It is of interest to everyone on account of its striking red color and to those who like to eat mushrooms because of its digestibility and its peculiar, slightly acid taste which is agreeable to many persons.

In our vicinity it is found mostly upon chestnut stumps. The blight which obliterated that noble and predominating tree of our woodlands early in the present century brought with it one benefit: the scourge left in its wake millions of dead chestnut trees and stumps which, during the past three decades, have harbored beefsteak mushrooms—or chestnut tongues as they are also named. W. A. Murrill, mycologist formerly with The New York Botanical Garden, foresaw this and wrote in 1910: "Since the chestnut trees have all been killed by the canker, the beefsteak fungus should appear in great quantity." It has.

The botanical name universally assigned to the beefsteak mushroom at present is *Fistulina hepatica,* a Latin-Greek hybrid term. "Fistulina" (Lat.) or little pipe, applies to the tiny spore-bearing tubes on the under surface; "hepatica" derives from the Greek word "hepatikos" meaning liver-like and refers to the color and appearance of mature specimens.

Former scientific names of this mushroom have been *Boletus hepaticus, Buglossus quercinus, Fistulina buglossoides, Hypodrys hepaticus* and *Polyporus quercinus.*

Among the popular names of the beefsteak mushroom that are in present use are the following, in alphabetical order: beef tongue, beefsteak fungus, Blutzunge (Ger.), chestnut tongue, fistulina foie (Fr.), foie de boeuf (Fr.), fungus pauperibus

esculentus (Schaeffer), glu de chêne (Fr.), higado de buey (Sp.), langue de boeuf (Fr.), langue de châtaignier (Fr.), langue de chêne (Fr.), Leberpilz (Ger.), Leber Reischling (Ger.), lengua de buey (Sp.), lingua di castagne (Ital.), liver fungus, oak tongue, Ochsenzunge (Ger.), poor man's mushroom, vegetable beefsteak.

It is a stout, fleshy, lignatile, horizontal, shelf fungus, fan-shaped or semicircular, usually reaching the size of a human hand, dark red above and flesh-colored or whitish underneath. The meaty color and consistency, the moisture, and the streaky section are unmistakable guides in recognizing this species.

The type known in this country is found in woods, on dead chestnut or rarely on oak stumps, and usually within one foot of the ground. Among the thousands of specimens which I have collected, only one grew as high as two and a quarter feet in elevation.

Although this is, strictly speaking, a lignatile shelf fungus, I have collected a few specimens growing from the surface of the earth, with centrally implanted stem which made them resemble a boletus at first glance. On digging out the stem, however, this was found to proceed from a buried chestnut-root in each instance.

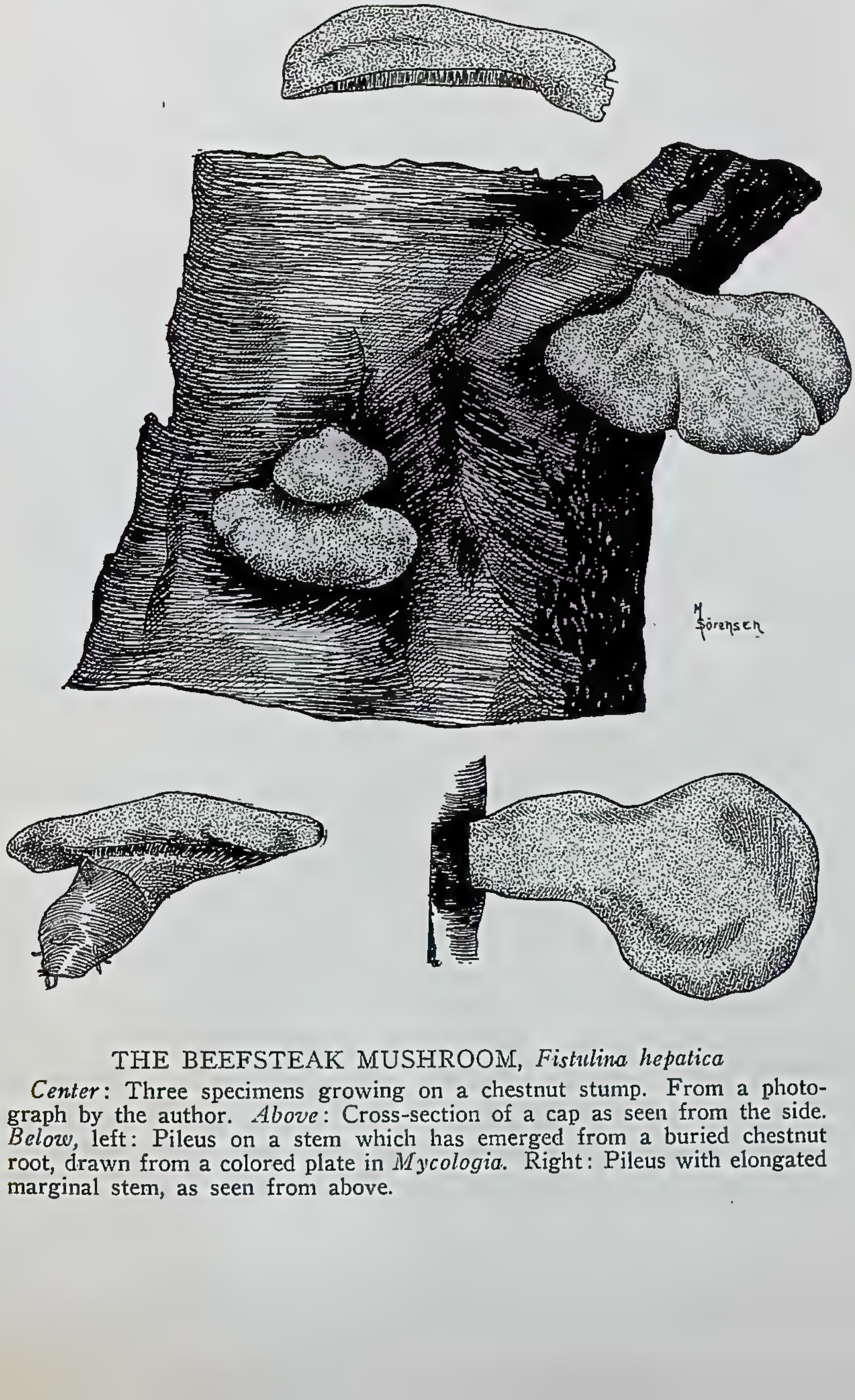
The beefsteak mushroom is common in Canada and in the eastern United States and is probably widely distributed, though I have not found it reported further west than Minnesota. The European type is abundant in Great Britain and on the continent, but seems to differ in some respects from the American form, as is mentioned hereafter.

In the woodlands near New York City, where it appears from late July until the advent of frost, it is so assiduously sought by foreigners that paths are often found leading to chestnut stumps, vestiges of the blight of 1909.

The beefsteak mushroom is usually of solitary habit but occasionally one sees two or three specimens growing from the same stump, either superimposed or at a distance from each other. On rare occasions I have found weather conditions so favorable as to afford a beefsteak mushroom on five per cent of all of the stumps visited. As a rule, however, in woodlands within fifty miles of New York City and at the season's height, one is fortunate if he sees the desired red glow upon one chestnut

stump in each thirty or more inspected. But the chestnut stumps are many in our woodlands today, a generation after the blight's fatal advent.

The appearance of a tiny crimson knob on the side of a stump announces the coming of the beefsteak mushroom. This



THE BEEFSTEAK MUSHROOM, *Fistulina hepatica*

Center: Three specimens growing on a chestnut stump. From a photograph by the author. *Above*: Cross-section of a cap as seen from the side. *Below,* left: Pileus on a stem which has emerged from a buried chestnut root, drawn from a colored plate in *Mycologia.* Right: Pileus with elongated marginal stem, as seen from above.

knob grows larger and develops into the complete shelf or fan-shaped fungus. The pileus or spore-bearing portion of the plant is crimson above when young, blood-red when mature, and deep liver-colored when decay is about to begin. The under or pore surface is flesh-colored or yellowish white. The edge where the upper and under surfaces meet is rounded and is sometimes lobed or notched.

The red upper surface is moist and covered with a viscid skin or pellicle, enclosing a pink jelly-like layer an eighth of an inch or more in thickness over the firmer fibrous flesh. Variations are frequently found in this jelly-like layer in the different specimens collected. Some caps are but slightly viscid, and actually leathery above while within the hour other specimens may be found with their upper surfaces bright red and movable upon the flesh beneath like the skin on the back of one's hand. When the jelly layer is present, it is thickest near the stem and thins out toward the free edge of the cap. It is easy to peel all specimens, whether moist or dry, young or old. The skin is picked up with a knife near the stem and peeled off toward the free edge.

The flesh, when uncovered, is found to be reddish with lighter colored fibres radiating away from the stem. Pinkish watery juice exudes from the flesh of young specimens or may be expressed by squeezing. A section of the cap, when cut across, reveals a marbled or streaked surface that somewhat resembles a section of boiled beef tongue and gives to the fungus the first of its many popular names, which are cited above.

The tubes or spore-bearing portion of this mushroom extend over its whole under surface. They are whitish or flesh-colored when young and rusty-brown when old, and each one of all of the myriads of them is precisely vertical when the cap is in its normal horizontal position. It is in their lumens that the spores are formed and liberated. These then drop down through the short tubes and are thus set free to fall to the earth or to be dispersed by the wind. Those which alight upon another stump, when conditions are favorable, form a starting point from which fibres of new mycelium find their way through the substance of the dead wood and eventually send out a new pileus or fruiting body.

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The tiny tubes are crowded together and their apertures below are so small as not to be easily seen without the aid of a lens. They are about one-eighth of an inch or less in length and are fastened so firmly to the flesh above them that they cannot be torn away from it. Nor can they be easily cut, so tough are they. They are not attached to each other, however.

In dry summer and autumn weather the beefsteak mushroom sometimes becomes dessicated when old but, true to the type of most of the fleshy fungi, it usually ends its existence in a state of repulsive putridity. At this stage its juice stains the fingers an unsightly red.

The shelf-like pileus is but the fruiting body or spore-producing portion of the plant. Its vegetative portion, or mycelium, consisting of a network of fibres coursing through the dead wood of its host, has apparently been overlooked by the botanists.

The size of the cap varies with its age and degree of development. When fully matured under favorable (damp) weather conditions, it reaches a diameter of six or eight inches and a thickness of one and a half inches. Dry weather appears to impede its full development so that during droughts beefsteak mushrooms of full size are not found. At times when damp weather, however, has persisted during the ten days or two weeks required for full growth of this fungus, I have collected specimens reaching a diameter of nine inches and weighing a pound.

The thick tough stem is usually lateral, that is to say, it is attached to the margin of the cap. At its attachment thereto the stem is continuous with the flesh and though usually short, in some cases may be traced into and vertically down through the decayed wood of the host for a distance equal to the cap's diameter. As thick as the cap at its attachment, the stem tapers downward to a blunt point below. It is less moist than the cap and is too tough to be eaten. In cross section, the stem reveals a marbled pattern of lighter red or yellowish fibres on a deep red surface. The stem is often furrowed longitudinally.

The spores are elliptical, yellowish, and 5 to 6 microns long, that is to say, one five-thousandth to one four-thousandth of an inch in length. Single spores are visible, of course, only under the high-powered microscope. Spore masses of the beefsteak mushroom are seldom seen. This fact is doubtless partly due to their falling several inches before resting upon the ground so

that they become well scattered. Their color, too, blends with that of the dead leaves under them and tends to make their so-called natural spore prints invisible.

The odor of the beefsteak mushroom is fruity or sometimes a little vinous and the species is unique among fungi in having a slightly acid flavor. Its esculent qualities are universally lauded by contributors to mycologic literature. Some of their statements appear somewhat extravagant. For example, M. C. Cooke, a noted English mycologist late in the nineteenth century, wrote that "when young, if sliced and grilled, it would pass for a good beefsteak."

Actual experience and the expressed opinions of individuals, however, show that there is no disputing matters of taste. The slightly sour taste is disagreeable to some persons. Many others like it when it has been properly cooked or when sliced thin and eaten raw, properly dressed as a salad. It is edible up to the time of the setting in of decay. Dry specimens may still be found edible after soaking in water.

In preparing it for the table, the upper peel is removed and with it the jelly-like layer, if present. The tiny skippers of larvae sometimes found on the spore surface need not cause rejection of the mushroom. They disappear when it is plunged into scalding water. The fleshy portion, with the tubes still attached, is sliced across the grain of the fibres and the slices are ready for cooking or eating raw.

My own experience agrees with that of W. H. Gibson who, after experimenting with different methods, fell back upon the plebeian one of simply broiling the slices over coals or frying or roasting them in the pan with a little seasoning or butter, pepper and salt, and perhaps a little onion salt, relying upon the mushroom itself to furnish the dominant flavor.

If one wishes to cook the mushroom with meat, the slices may be macerated in salt, putting the exuded juice in a dish with a little lemon juice and minced scallions, and using the whole as a dressing for broiled steak.

It may also be stewed or fricaseed and affords a good soup with a taste suggesting that of beef broth or clear consommé.

* * *

Examination of the literature makes it evident that our American *Fistulina hepatica* differs in several respects from the European

mushroom which bears the same name. Perhaps the dissimilarities may best be shown in parallel columns.

Character	*Fistulina hepatica*	
	European	American
Size	Attaining the diameter of one meter.	Ten inches the largest diameter.
Toughness	Too tough to be eaten when old.	Edible at all stages before decay sets in.
Taste	Usually slightly sour. Sometimes like tannin (acrid).	Usually slightly sour. Never puckery (acrid).
Mode of growth	Sometimes parasitic on living trees.	Always growing on dead wood.
Host	Grows on oak, chestnut, ash, beech, hornbeam, elm, willow, walnut.	Grows on chestnut and on oak only.
Height from ground	Majority of examples found growing 7 or 8 feet from the ground.	Grows less than 3 feet from the ground.
Incidence	Found in great abundance. A hundredweight may be gathered in a short time.	A five pound mess is considered a good afternoon's harvest.

* * *

It is possible that the host may influence certain characteristics of specimens of *Fistulina hepatica.* European writers allude to its toughness when old. Our American specimens are not tough at any period of their growth. European specimens are found growing upon several species of deciduous trees and upon living wood. Here, I have never seen or heard of their growing upon a living host or upon any dead wood except that of chestnut or oak trees. A certain experience with a form of this mushroom has helped me to appreciate the fact that its host may possibly influence one of its characteristics. A great piece of mahogany timber floating in salt water at a Staten Island lumber yard yielded a half-dozen specimens of the fungus identical with our American *Fistulina hepatica* except that the jelly-like subcuticular layer was absent and the fleshy portion was corky and hence inedible. There was present a faint trace of the rather pleasant, slightly acid taste of the type familiar to us here.

According to the English mycologist, Delisle Hay, it was *Fistulina hepatica* which the Druids cut from oak trees with golden sickles and much ceremony. Many a rare feast on its succulent flesh was celebrated by them in the mystic recesses of their forest temples.

William Sturgis Thomas.

THE JUNGLES OF MANHATTAN ISLAND—II

Shrubs and Trees of Inwood Hill Park

Human occupation, the white man's style, has depopulated Manhattan Island of its native vegetation as efficiently, if not yet quite as thoroughly, as did the glaciers of the Ice Ages. Then all vegetation yielded its right to occupy the island to a solid mass of ice, assumed to have been at times hundreds or thousands of feet thick.

However, vegetation had more than the ice itself to contend with. As the glaciers advanced from the north, slowly but surely, floods of water must have heralded their coming. Regular Niagara whirlpools doubtless rushed ahead of the melting ice-front spreading out over the land far to the south. The action of the water is not very evident in the flat country, except in the detritus foreign to those parts, but in the exposed elevated rocky places the rush of the water made various sized potholes by the whirling or swirling of pebbles, cobble-stones, and rock fragments in depressions of the rock surface, or by the drilling with pebbles moved by water falling from the high front of the glacier. Good examples of these drilled cavities in the rock may be seen on the cliff-like sides of Inwood Hill at the northern end of Manhattan Island. Some of them are intact, while only half of others remain, indicating that the potholes made by one glacier were often partly destroyed by the severe grinding of a subsequent glacier. (See Figure 2.)

Inwood Hill Park, comprising more than 100 acres, is separated from the northern end of Fort Washington Park by a small valley and stream through which depression Dyckman Street now runs out to the Hudson River. A mass of rock naturally isolated at the northern end of Manhattan Island, Inwood Hill is bounded by the valley just referred to on the south, Spuyten Duyvil Creek on the north, the Hudson River on the west and lowland sloping off to the Harlem River on the east. Thus Inwood Hill is an entity, whereas Fort Washington Park is merely a slice cut by Riverside Drive off the western or Hudson side of a somewhat similar rocky hill of greater extent. Part of the hill was evidently the site of successive aboriginal villages and Indian fields.

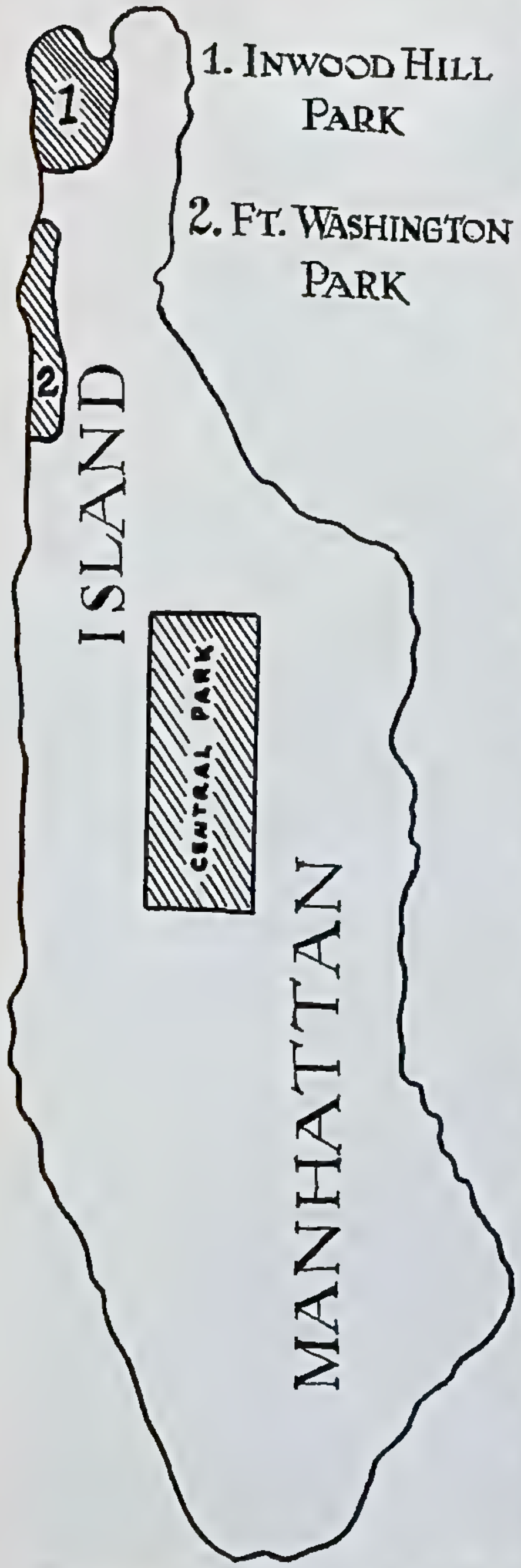

FIGURE 1. Manhattan and its principal parks.

In historic times it became a Dutch settlement, later a Revolutionary fort, next a farm, then an apiary, a picnic ground, a rendezvous for nature - study classes, and finally a city park and playground. Of this latest stage the present paper deals.

Fortunately for the present generation, the extremely rocky structure of the hill with its steep sides has been instrumental in preserving the natural vegetation. After the Indians used the hill for village sites and a rendezvous, the white-man scalped it, so to speak, removing the native vegetation on the top, thus making way for his various activities. Here is where the greatest numbers of the exotic shrubs and trees are to be found.

The steep sides of the hill, useless in the white man's occupation, is where the native plants now exist.

As the rigors of the glaciers, which were the second major catastrophe[1] of this region, gradually waned, a great superstructure of boulders, rock-fragments, and soil covered the polished rock structure of this hill. As in the case of Fort Washington Park, erosion—frost, rain, and wind—through subsequent ages removed much of this material. Some of it was naturally carried down to the Hudson River on the west, and an essentially similar amount

[1] A preceding catastrophe will be described in a subsequent article on the shrubs and trees of the vicinity of New York.

was carried down to make the plain between the hill and the Harlem River on the east. These east and west flanks are along the axis of the hill, so they naturally relieved the top and slopes of the greater part of the superstructure. The north and south ends of the hill furnished the material which gradually filled the adjacent valleys.

The top of the hill retained a good amount of soil, the sides retained some, according to the sloping and shelving of the rock-mass, but the perpendicular parts naturally are bare of soil. Much of the vegetation, therefore, rests securely on and about the summit and in the valley at the bottom of the depression between the two ridges, facing north. That growing on the rocky sides hangs on at its own risk, much of it falling away as the soil fails it, either dying or accidentally getting a foothold on another shelf of a cliff or in a crevice.

Following is a list of the shrubs and trees growing naturally in Inwood Hill Park[2] and those planted and persisting or naturalized there.

NATIVE	NATURALIZED
White pine—*Strobus Strobus*	
Hemlock—*Tsuga canadensis*	
	Black pine—*Pinus nigra*
	White cedar—*Chamaecyparis thyoides*
	Maidenhair-tree—*Ginkgo biloba*
Cottonwood—*Populus deltoidea*	
Large-toothed aspen—*Populus grandidentata*	
Quiver-leaf—*Populus tremuloides*	
Glaucous greenbrier—*Smilax glauca*	
Catbrier—*Smilax rotundifolia*	
	White poplar—*Populus alba*
Black willow—*Salix nigra*	
	Bay-leaved willow—*Salix pentandra*
	Crack willow—*Salix fragilis*
	White willow—*Salix alba*
	Weeping willow—*Salix babylonica*
Diamond willow—*Salix cordata*	

[2] It has been of both general and special interest to record the vegetation growing on two natural monuments, the sole remaining native forested areas in the whole of Manhattan Island. For a description of the trees and shrubs of Fort Washington Park see this Journal for Sept. 1936. The list of shrubs and trees is printed complete as a matter of present information and as a basis for future comparisons as the vegetation shall have been modified, naturally or artificially, in coming generations. About 14,000 acres of City park land on Manhattan Island have been despoiled of their native vegetation and left bare or planted largely with exotic shrubs or trees in a way that means nothing, except so much foliage to catch the passing eye.

FIGURE 2. A shaded trail on the lower side (on the top) of Inwood Hill. Only deciduous trees are involved, so that in winter greenery is wanting.

NATIVE	NATURALIZED
Bayberry—*Cerothammus carolinensis*	
Walnut—*Wallia nigra*	
Butternut—*Wallia cinerea*	
Bitternut—*Hicoria cordiformis*	
Mockernut—*Hicoria alba*	
Pignut—*Hicoria glabra*	
Hornbeam—*Carpinus caroliniana*	
Ironwood—*Ostrya virginiana*	
White birch—*Betula populifolia*	
Sweet birch—*Betula lenta*	
Smooth alder—*Alnus rugosa*	
Beech—*Fagus grandifolia*	
	European beech—*Fagus sylvatica*
Red oak—*Quercus maxima*	
Pin oak—*Quercus palustris*	
Black oak—*Quercus velutina*	
Gray oak—*Quercus borealis*	
Scarlet oak—*Quercus coccinea*	
Chestnut oak—*Quercus montana*	
White oak—*Quercus alba*	
Elm—*Ulmus americana*	
Slippery elm—*Ulmus fulva*	
Hackberry—*Celtis occidentalis*	
Mulberry—*Morus rubra*	
	White mulberry—*Morus alba*
	Osage-orange—*Toxylon pomiferum*
Cucumber-tree—*Tulipastrum acuminatum*	
Tulip-tree—*Liriodendron Tulipifera*	
	Thunberg's barberry—*Berberis Thunbergii*
Sassafras—*Sassafras Sassafras*	
Spice-bush—*Benzoin aestivale*	
Virgins-bower—*Clematis virginiana*	
Witch-hazel—*Hamamelis virginiana*	
Sweetgum—*Liquidambar Styraciflua*	
	Mock-orange—*Philadelphus coronarius*
	Syringa—*Philadelphus grandiflorus*
Plane-tree—*Platanus occidentalis*	
Blackberry—*Rubus ostryifolius*	
Island blackberry—*Rubus rhodinsulanus*	
Mountain blackberry—*Rubus alleghemiensis*	
Dewberry—*Rubus flagellaris*	
Southern dewberry—*Rubus Enslenii*	
	European raspberry—*Rubus idaeus*
Flowering raspberry—*Rubacer odoratum*	
	Rowan-tree—*Sorbus Aucuparia*
Shadbush—*Amelanchier canadensis*	
	Pear—*Pyrus communis*

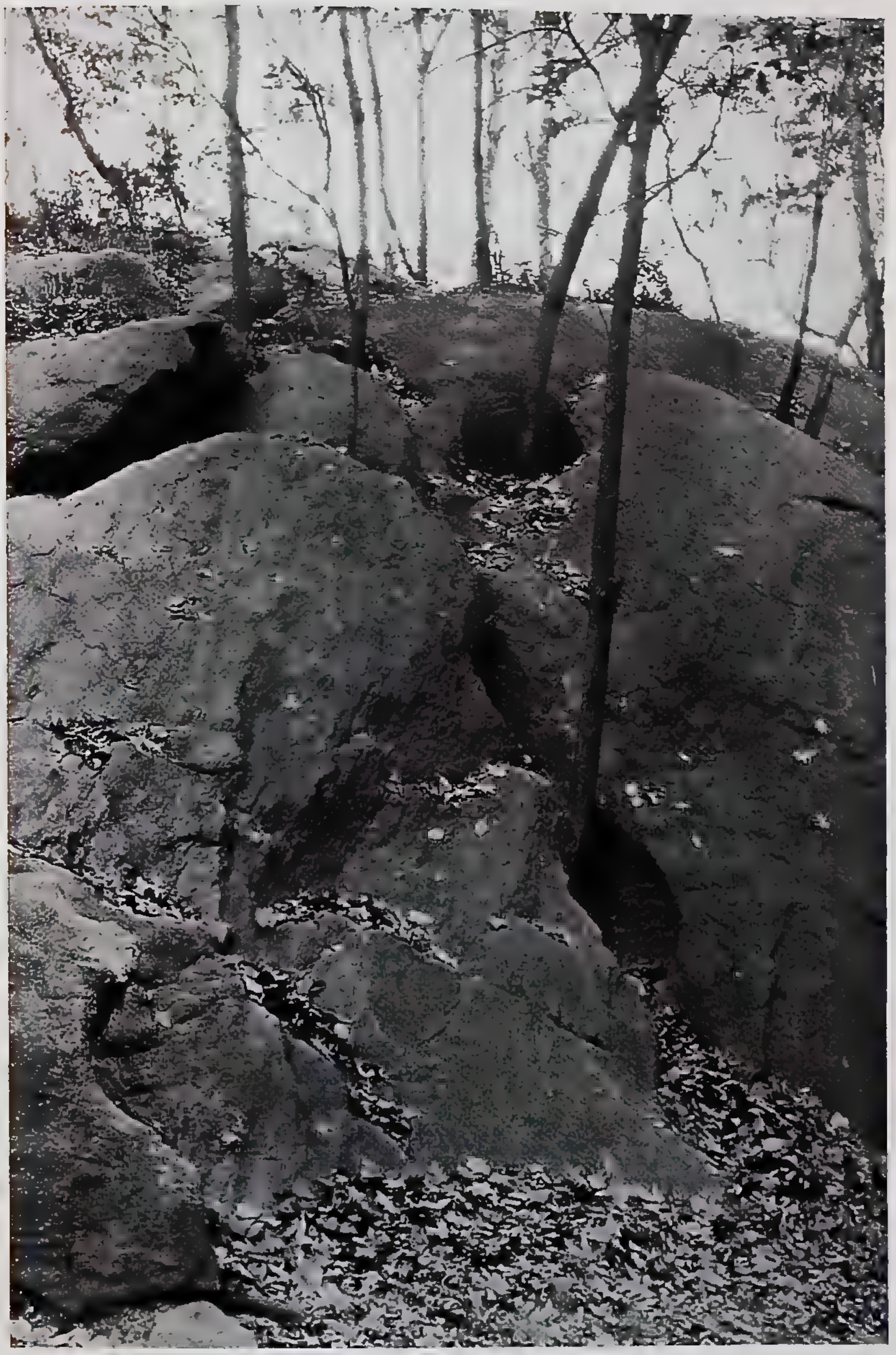

FIGURE 3. Three potholes in a large rock exposure. The upper one containing a tree is nearly intact. The two lower ones were partly destroyed by the grinding of a glacier subsequent to the one that first made them.

NATIVE	NATURALIZED
Wild cherry—*Padus virginiana*	Apple—*Malus Malus*
	Sour cherry—*Prunus Cerasus*
	Plum—*Prunus domestica*
	Peach—*Amygdalus Persica*
	Honey-locust—*Gleditsia triacantho:*
	Locus—*Robinia Pseudoacacia*
	Clammy locust—*Robinia viscosa*
	Tree-of-Heaven—*Ailanthus altissima*
Dwarf sumac—*Rhus copallina*	
Staghorn sumac—*Rhus hirta*	
Smooth sumac—*Rhus glabra*	
Poison ivy—*Toxicodendron radicans*	
Climbing bittersweet—*Celastrus scandens*	
	Asiatic bittersweet—*Celastrus articulatus*
Silver maple—*Argentacer saccharinum*	
Red maple—*Rufacer rubrum*	
Sugar maple—*Saccharodendron barbatum*	
Box elder—*Negundo Negundo*	
	Horse-chestnut—*Aesculus Hippocastanum*
Fox grape—*Vitis Labrusca*	
Silver grape—*Vitis argentifolia*	
Virginia creeper—*Parthenocissus quinquefolia*	
New Jersey tea—*Ceanothus americanus*	
American linden—*Tilia americana*	
Michaux linden—*Tilia Michauxii*	
	European linden—*Tilia spectabilis*
	Shrubby-althaea—*Hibiscus syriacus*
Dogwood—*Cynoxylon floridum*	
Sourgum—*Nyssa sylvatica*	
Sweet-pepperbush—*Clethra alnifolia*	
Deerberry—*Polycodium stamineum*	
Blueberry—*Cyanococcus vacillans*	
Black huckleberry—*Decachaena baccata*	
White ash—*Fraxinus americana*	
Green ash—*Fraxinus pennsylvanica*	
	Lilac—*Syringa vulgaris*
	Privet—*Ligustrum ovalifolium*
	Karri-tree—*Paulownia tomentosa*
	Catalpa—Indian-bean—*Catalpa Catalpa*
Elder—*Sambucus canadensis*	
Black-haw—*Viburnum prunifolium*	
Arrow-wood—*Viburnum dentatum*	
Nannyberry—*Viburnum acerifolium*	
	Snowberry—*Symphoricarpos albus*

The one outstanding product of the vegetable kingdom on the hill is the celebrated tulip-tree[3] whose trunk is about six feet in diameter, with an age assumed to be over two and a half centuries. All efforts to prolong the life of this tree have failed and at present it is essentially an almost lifeless trunk. It grew on an Indian kitchenmidden and village site, the fertility of the soil being augmented by the refuse from the aboriginal cuisine.

Conifers are scarce, but an occasional hemlock may be encountered on the upper and lower slopes. A lonesome white pine and an introduced black pine may be seen on the western slopes.

In moist places on the lower edges of the hill there are willows. The native ones, the black willow and the diamond willow, occupy the depressions. This native growth is augmented by the naturalized crack willow, the white willow, weeping willow and various hybrid willows. Two relatives of the willows, the quiver-leaf and the large-toothed aspen, may be found on the higher ground. Here too are to be seen tulip-trees, ashes (the white and the green), sweet birch, white birch, ironwood and hornbeam. Oaks are irregularly spaced about the hill. There are several different kinds—white, black, scarlet, pink, red, gray, and chestnut. But nowhere are the oak trees so well assembled to show their glorious individual shades of green as they are in Fort Washington Park.

The hickory, that outstanding American genus, is represented on various parts of the hill by the mocker-nut, bitter-nut and pig-nut. As one ascends the eastern slope of the hill a scattered collection of the butternut or white walnut is an outstanding feature of the vegetation.

Most of the genera that contain more than one species in the Local Flora Area are represented by a single species on Inwood Hill. Among these are: bayberry, smooth alder, shadbush, wild cherry, poison ivy, sugar maple, sour gum, black huckleberry, and blueberry.

The trees are mostly spindly because of the rather thick growth. The shrubs are more densely placed and often form barriers. This is particularly true where the stems are bound together by grape-vines or brambles. In these cases all the force that one can command to push through fails, unless one resorts to some cutting of branches.

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[3] The botanical names of the shrubs and trees mentioned here may be found in the preceding list.

These thickets form a refuge for birds that are accustomed to dwell in such places, while the open spaces and the shade of tall trees furnish haunts for other kinds of birds. Since it is an isolated spot hemmed in by modern civilization, migratory and other birds welcome this shelter. More than one hundred kinds of birds have been seen on and about Inwood Hill over a number of years by Erik Peterson, who has made a study of the park. We venture to say that no equal area in Manhattan can show such a large number and variety of kinds of birds. The bird-life is replenished by the migratory habits of many species. On the other hand, the native reptilian and mammalian life has been largely or wholly exterminated.

Few of the native shrubs and trees are outstanding on account of their flowers, though the native tulip-tree, shadbush, wild cherry, linden, dogwood, sweet-pepperbush, elder, brambles and arrow-woods are exceptions. Among the introduced shrubs and trees we find the mock-orange, rowan-tree, pear, apple, cherry, plum, peach, clammy locust, horse-chestnut, shrubby-althaea, lilac, paulownia, and catalpa outstanding. So much for the esthetic.

The economic is several-sided. More than a fourth of the shrubs and trees furnished food for birds and mammals. As for the Indian, much food grew right at his back door. He used many of the berry fruits that also fed the native animals. In addition to these he had the choice of more than a dozen nut-trees. Passing over the various mechanical advantages which the vegetable growth of the hill offered the Indian, it should be said that the inner bark of the red mulberry afforded him substantial material for clothing. The vegetable product was such an important item that today we find the mulberry tree on all aboriginal village sites along the Atlantic Coast as far south as Cape Sable, Florida. Withal, Inwood Hill was an aboriginal paradise.

JOHN K. SMALL.

SOME PHASES OF THE JAPANESE BEETLE PROBLEM

Ever since the New York Herald Tribune published an editorial, "Man Against Bugs," on July 24, largely based on facts supplied by Dr. B. O. Dodge, there has been some protest over the use of poisonous chemicals which are assumed to be killing birds, squirrels, dogs, and even poisoning fruit, all in the effort to eliminate the Japanese beetles. The other side of the story has scarcely had a chance.

It is quite true that arsenate of lead, which is spread on lawns and sprayed on trees, shrubs, and garden flowers to protect the green growing things against the beetles, is poisonous. But perhaps it is not as deadly dangerous as some have declared. It has been proved that lead arsenate, when properly applied and washed into the soil so that no lumps are left lying on the ground, does no damage to bird, pet, or child. People with their dogs have been seen, against the orders of the "keep off" signs, lounging on lawns that had recently been sprayed with lead arsenate and have suffered no known injury. Mr. R. S. Williams of the Garden's scientific staff for years was suspicious of the policy of spraying the woodland trees, for the Botanical Garden is a haven for native birds. But in his frequent walks through the woods along the Bronx River, he has stated this year that he has not yet seen any evidence whatever of birds or squirrels having died from the effects of the spray.

It is known that starlings and a few other birds are helpful in eliminating some of the beetles, for they pick the grubs out of the soil in spring; and the starlings, at least, feed the insides of the adult beetles to their young. But so far as is known, few American birds will eat Japanese beetles. Perhaps that is because the diet is foreign to them. Possibly in Japan they devour them wholesale and thus help to keep their numbers down. But the greatest enemies of these beetles in the orient are the insect and fungous pests which prey upon them. Nobody knows how many hundreds or thousands of years it has taken for Japan to acquire a balance which keeps the destructive beetles in check. Biological control may someday be possible in this country, but meanwhile the citizens in the beetle-infested areas must unite and support all agencies which are working toward the destruction of this pest. Community mass meetings such as the one held the evening of

August 25 at Mount Kisco, N. Y., are helpful means of organizing proper control measures.

If good sense is used, there need be no fear of poisoning living creatures which should be saved. Good sense, of course, dictates that poisonous sprays should not be used on fruit and vegetable crops. Instead, Dr. Dodge points out, a spray consisting of 4 pounds of hydrated lime, 1 pound of aluminum sulphate, and 20 gallons of water may be used. This will repel many beetles and will keep the food safe for eating, but it will not destroy the grubs which live in the lawn and from which every summer the beetles develop. That is why the lead arsenate is essential for complete control. Mushrooms and other crops which are growing in soil that has had an arsenate treatment should be avoided, although it has not yet been proved whether or not the plants absorb the poison into their tissues.

At the Botanical Garden it has been estimated that three tons of arsenate of lead will treat 10 to 15 acres of lawn effectively if applied to that area once every five years. Bought in large quantities, the chemical costs around $200 a ton. If purchased by the pound for smaller areas, the cost is proportionately greater. One acre of lawn can be satisfactorily protected with 400 pounds of lead arsenate washed in thoroughly at any time of year. For absolute control, Dr. Dodge recommends using about three times as much.

Though grubs are killed this way, the beetles which fly into the garden—perhaps from someone else's grounds where no arsenate was used—must be fought in other ways. Contact spraying brings some protection, but is effective only against those beetles which are completely covered by the spray as it strikes the plants. Traps are the means of destroying the largest numbers, and here is where co-operation is especially necessary. One or two traps in a garden will merely attract the beetles from several hundred feet around, and on their way in following the scent of the geraniol bait they will eat more foliage than would have been destroyed if no traps had been erected. Therefore, over any infested area, enough traps should be used to catch all of the beetles around, without giving them a chance to pause and destroy on the way to their death.

Traps can be purchased at prices ranging from 35 cents to two dollars. The geraniol mixture (10 parts geraniol to 1 part

eugenol) with which they are baited costs 25 to 50 cents a season for each trap. Many seed stores, hardware stores and department stores carry these materials. Lists of firms which handle the traps and bait may be obtained from C. H. Hadley of the Japanese Beetle Laboratory at Moorestown, New Jersey, where circulars describing the pest and the best methods of control may also be obtained free of charge. Similar information will be given out on request by the plant pathology department of The New York Botanical Garden.

Protection of birds is a worthy ideal with which every plant pathologist is in sympathy, but if birds were to change their present diet and they alone were expected to rid the country of Japanese beetles, it would seem as though the sky might be blackened by their wings as they flew from garden to garden for their feast of millions.

CAROL H. WOODWARD.

AUTUMN LECTURES AT THE GARDEN

The series of free illustrated lectures to be given on Saturday afternoons during September, October, and November in the museum building opens September 11 with G. L. Wittrock speaking on "Native Plants used for Dyes and Paints by the American Indians."

All lectures start at 3:30 p.m. and the doors are promptly closed. Late-comers are admitted at 3:45, and the lectures end at 4:30. Other topics announced are as follows:

September 18. "Autumn Wild Flowers," Dr. John Hendley Barnhart, Bibliographer and Administrative Assistant.
September 25. "Garden Details," Mr. A. C. Pfander, Assistant Superintendent.
October 2. "Mushrooms, Edible, Poisonous and Otherwise Interesting," Dr. Fred J. Seaver, Curator.
October 9. "Autumn Coloration," Dr. A. B. Stout, Director of the Laboratories.
October 16. "Gardening Under Glass," Mr. T. H. Everett, Horticulturist.
October 23. "The Everglades, Past and Present," Dr. H. Beaman Douglass, Physician.
October 30. "Flower Arrangements," Mrs. Roy M. Lincoln.
November 6. "Trees in Winter," Dr. Forman T. McLean, Supervisor of Public Education.
November 13. "Winter in Oaxaca: Collecting Plants in Southern Mexico," Dr. W. H. Camp, Assistant Curator.
November 20. "Mushroom Collecting Experiences in Wisconsin," Dr. B. O. Dodge, Plant Pathologist.
November 27. "Some Marvels in Adaptation Among our Local Plants," Dr. Harold N. Moldenke, Assistant Curator.

TWO NEW GARDENING COURSES ANNOUNCED

Study courses announced for the coming season at the Botanical Garden will include two new series of lectures in practical gardening. While they are designed as requirements for the student gardeners, they will be open to amateurs who have a serious interest in gardening.

The first course of lectures, to deal with the **Fundamentals of Gardening,** will start on Thursday, September 30, and continue through December 23. For the first five weeks the class will meet at 5:15 p.m. in the museum building. From November 4 to the end of the course the group will assemble at 4:45 for the regular hour's lecture. The course will be conducted by T. H. Everett, Horticulturist.

Following this there will be a series of lectures in **Outdoor Gardening** by P. J. McKenna, Foreman Gardener, starting at 4:45 p.m., on January 6. This course will continue through March 28, meeting at 5:15 p.m. from March 3 to the end of the month.

The fee is ten dollars for each course of 12 lectures. Members of the Garden, in these as in the courses described below, will receive the usual credit on their registration fee to the amount of their annual subscription to membership.

Other courses to be given during the coming months include consecutive studies of trees in autumn, winter, and spring, besides a short spring course on the identification of ferns. These are all given under the direction of Dr. Forman T. McLean. The first, **Tree and Shrub Studies,** is a field course in the identification of our native and commonly planted species of woody plants as seen at the Garden. Six weekly Saturday morning sessions will be held from 9:30 to 12:30, beginning September 25.

Knowing Trees by their Buds, Bark, and Shape in Winter is the title of the second course, which will be given in two-hour sessions on ten Saturday mornings beginning November 13 and continuing through January, the Christmas vacation period being omitted.

Starting on April 18, six three-hour sessions will be held on **Leaves and Flowers of Trees and Shrubs in Spring.**

The fee for each of these courses is six dollars, with New York City teachers being admitted for half price.

The course on **Our Native Ferns and their Allies** will be covered in six meetings on Tuesdays at 4 p.m. beginning April 19. The fee is five dollars.

PELARGONIUMS AND BEGONIAS FOR DISTRIBUTION

Members of The New York Botanical Garden this month will have the opportunity to share in the distribution of a thousand plants of a dozen different species and named varieties of *Pelargonium* and of a limited number of begonias.

The first 100 members to call at the Garden after the receipt of this Journal will each be given up to ten specimens of pelargoniums in variety. Identification cards, to be presented at Conservatory Range No. 2, where the plants will be distributed, will be obtainable at the office of T. H. Everett, Horticulturist, in the Museum Building.

The plants are all healthy small specimens in 2½- or 3-inch pots, ready for transplanting into larger containers, and all are kinds which are suitable for indoor culture under sunny conditions.

Many of these pelargoniums were specially imported from England two years ago.

By arrangement with an outside agency, the Garden has made it possible for members who find it inconvenient to call for the plants in person to have them sent express collect. In this case, 25 cents must be sent to the Garden at once to cover the cost of packing. No plants, however, will be shipped outside of the Japanese beetle quarantine area, because of the necessity of removing the soil for inspection and thus endangering the life of the plants. Roughly, this area covers all of Massachusetts, Connecticut, Rhode Island, New Jersey, Delaware, and parts of the adjoining states, including all of southeastern New York, most of Pennsylvania, the southern half of New Hampshire and Vermont, and the southern corner of Maine.

The limited number of begonias which will be ready for distribution at the same time as the pelargoniums are larger plants, and because of their fragile nature they will not be shipped. Not more than two begonias will be given to any applicant.

NEW EXPEDITION TO SOUTH AMERICA

Dr. A. C. Smith left August 27 with the American Museum Terry-Holden expedition to spend four months or more exploring for plants in British Guiana.

As botanist for the expedition, of which Dr. W. H. Holden is the leader, Dr. Smith will have three objectives to carry out: first, to learn from little known Indian tribes what plants they use for medicines and poisons and to get specimens of these; second, to study the flora of the region, parts of which are certain to provide species and genera which are new to science; and third, to bring back seeds of plants which may have horticultural possibilities.

The area to be covered will in large part be that which was seen a century ago by Robert Schomburgk, the discoverer there of the royal waterlily, *Victoria regia,* and up to date the sole botanical authority on the region. Several types of country will be traversed. Back of the coast there will be the thick rain forest drained by the Essequibo, where trees 200 feet high will not be unusual and where herbaceous plants will be few in number. In the Rupununi district will be found savannas, or natural grasslands, containing mostly herbaceous plants interspersed with shrubby thickets. The party hopes to explore the Kanaku mountains near the Rupununi river, which are entirely unknown botanically. While the flora there is expected to bear some relation to that of Mount Roraima to the northwest, it is certain that many new species and possibly new genera will be found. In the rain forest to the southeast and in the low mountains which separate Brazil from British Guiana, the trees are expected to reveal some new and distinct species. Specimens of wood as well as of flowers and leaves will be collected.

This is Dr. Smith's third expedition into South America, but his first into British Guiana. The progress of the explorers is expected to be reported weekly or oftener over radio station WJZ.

NOTES, NEWS AND COMMENT

Stephen G. Cutting sailed for England July 9 to spend a year as exchange student gardener at Kew. Howard Swift, the first of The New York Botanical Garden's exchange students, returned from Kew Gardens early in July.

Dr. A. B. Stout attended the initial meeting of the newly organized Lily Committee of the American Horticultural Society July 9, in Washington, D.C. Preliminary plans were made for disseminating recently determined knowledge regarding the culture and diseases of lilies. It was also proposed to publish a yearbook on lilies similar to the one now being issued on daffodils.

REVIEWS OF RECENT BOOKS

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

Growing Grapes for Wine-making[1]

Philip M. Wagner's book "Wine Grapes" is admirable in every respect. It is a book that can be read with pleasure and profit by amateur grape growers, professional vineyardists, and by lovers of good wine. The book takes up, step by step, every operation in the growing of grapes. It tells how to choose the site for vineyards; lists the varieties best suited for various localities; and gives explicit directions for planting, grafting, pruning, training, cultivating and harvesting. In it the grape grower is told how to protect the vines from frost, fungi and diseases. No detail of grape growing is omitted. Accompanying these specific instructions are many observations concerning the natural history of vines which give the book charm for those interested in grapes and wines.

Of the hundred or more books published on grapes and wines in America, I do not recall one that is more readable. To one who has spent a lifetime in growing and breeding grapes there is much that is new and all is accurate. Mr. Wagner's book is bound to take a high place in the literature of American viticulture.

U. P. Hedrick, *Director,*
New York State Agricultural Experiment Station,
Geneva, N. Y.

Raising Good Vegetables[2]

I consider the "Vegetable Gardener's How Book" one of the most practical which it has been my privilege to read. The author has gone into every detail of vegetable gardening, and offers a carefully selected list of kinds which he names as the best. Instead of giving a long list like a copy out of a catalogue, he has picked what I would call the finest of them all.

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[1] Wagner, Philip M. Wine Grapes. 298 pages, illustrated, indexed. Harcourt, Brace & Company, New York, 1937. $2.50.

[2] Sherlock, Chesla C. The Vegetable Gardener's How Book. 286 pages, illustrated. Macmillan, New York, 1937. $3.

The cultural directions leave nothing to be added to them, and I feel safe in saying that anyone desiring to grow vegetables as a hobby—or, better still, for exhibition—will surely succeed if he grows them according to Mr. Sherlock's instructions.

ROBERT SCOTT,
Superintendent, Uplands Farm,
Mount Kisco, N. Y.

SHAKESPEARE'S FLOWERS[3]

"Shakespeare Gardens" gives to us the value of carefully collected material, both quotations and flowers. These four-hundred-year-old flowers are today our own in mature and developed beauty. Sixty varieties of flowers mentioned by Shakespeare are here described in a complete and concentrated book. Shakespeare gardens are now developed in various public parks and private places and this book of reference and research will be of utmost value to special students. Here the reader will find the medical and folk-lore traditions, and the historical development of garden design with unique and fascinating descriptions difficult to find elsewhere. Mrs. Carter's book is of value to the horticulturist and is important as a text or reference book.

EMILIE B. KELLOGG.

MOUNTAIN LIFE[4]

Mountains have always been a challenge both to the imagination and physical stamina of humans, for life among them depends upon the successful circumnavigation of the perimeter of a savage orbit of existence: *man versus nature versus man.* The interest we humans have in them, coupled with the knowledge that their multitude of different habitats invariably gives rise to a richer and more complex flora than that of the lowlands, has greatly stimulated botanical study of montane regions. Although Doctor Peattie's book is primarily a discussion of mountain peoples, it contains such a wealth of material on the underlying physical and climatic factors of mountain ecology that the botanist interested in the life of such places will welcome it. The text is not only an analysis of the basic factors of ecology, but also considers the primary and secondary modifying effects of human populations upon the biotic relations and development of high altitude floras—even as these in turn impose directional impulses and limitations on the lives of the residents of mountain communities. The classified and selected bibliography, unique in American studies of this subject, is unusually complete.

W. H. CAMP.

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[3] Carter, Annie Burnham. Shakespeare Gardens. 85 pages, indexed. Dorrance & Company, Philadelphia, 1937. $1.25.

[4] Peattie, Roderick. Mountain Geography. 257 pages, illustrated, indexed. Harvard University Press, Cambridge, Mass. 1937. $4.

THE NEW YORK BOTANICAL GARDEN

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The New York Botanical Garden was incorporated by a special act of the Legislature of the State of New York in 1891. The Act of Incorporation provides, among other things, for a self-perpetuating body of incorporators, who meet annually to elect members of the Board of Managers. They also elect new members of their own body, the present roster of which is given below.

The Advisory Council consists of 12 or more women who are elected by the Board. By custom, they are also elected to the Corporation. Their names are marked with an asterisk in the list below. Officers are: Mrs. Elon Huntington Hooker, Chairman; Mrs. Carl A. de Gersdorff, Vice-chairman; Mrs. Nelson B. Williams, Recording Secretary; Mrs. Townsend Scudder, Corresponding Secretary; and Mrs. F. Leonard Kellogg, Treasurer.

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

OCTOBER, 1937

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PERIODICALS

In a scientific institution, one of the important functions of the staff is to publish technical papers which, distributed over the world, make the results of their research available to other scientists. Thus the work of professional workers everywhere is correlated.

While staff members at an institution like The New York Botanical Garden frequently write for outside periodicals, both of a technical and a popular nature, certain of their work customarily appears in publications of their own organization. The Botanical Garden sponsors several scientific as well as two popular periodicals. *North American Flora,* actually a set of books which will some day be complete in thirty-four large volumes, offers a purely systematic, or taxonomic, classification of North American plants with complete descriptions. *Brittonia,* which is published intermittently, contains technical articles on the classification and geographical distribution of plants and is world-wide in its scope.

As America's principal technical publication devoted to fungi, *Mycologia* has now been published bi-monthly for twenty-nine years by The New York Botanical Garden. In recognition of its worth, the Mycological Society of America four years ago adopted *Mycologia* as its official organ.

While the technical publications are directed only to scientists, the Botanical Garden also issues two periodicals which are aimed to acquaint the people as a whole with the work of the institution, giving pertinent information through articles on botany and horticulture, and showing interesting plants which are raised at the Garden. Both of these magazines, this *Journal* and *Addisonia,* are distributed to all members of the Garden, or they can be acquired by subscription. Each issue of *Addisonia,* which appears twice a year, contains eight full-page plates in color with popular descriptions of the flowers illustrated.

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TRAINING OF STUDENT GARDENERS AT THE NEW YORK BOTANICAL GARDEN

Horticulture is as much an expression of the cultural development of a civilization as is art, music, or literature, reaching its fullest development only among a people possessing wealth and leisure as well as a sense of security and stability.

The arts of earlier civilizations have been passed on from generation to generation by writings and by personal instruction in the basic crafts. The continuity of personal instruction whereby the craftsman of one generation benefits from the accumulated knowledge and skill of preceding generations is at least as important as the preservation of the writings. In regions where a high standard of horticulture is maintained the vital need for a scattering of skilled professional gardeners in the horticultural community is evident. It is through these men that the traditions of the profession are handed on.

America during its period of settlement and advancing culture first placed emphasis upon the growing of economic crops. Coincident with the attainment of a measure of security and leisure was the development of landscape art, and America's greatest contribution to education in horticulture (as distinguished from agriculture) has been in the provision of adequate training in landscape architecture. Little attention has been given in the United States to the production of professional gardeners who possess a broad understanding of a wide range of plants and who are skilled in the maintenance of gardens. Hitherto Europe has been the chief source of supply of such men. For some years the desirability of training Americans in this field has been recognized and the enforcement of stricter immigration laws has stressed the urgency of this need.

Five years ago The New York Botanical Garden instituted a course of training for young American gardeners seeking to extend their experience and their knowledge of growing plants. The course was designed to bridge the gap existing between theoretical horticulture and practice alone as it is acquired by working in a commercial or private establishment. That a botanic garden is well suited for undertaking work of this kind is amply borne out by European experience. There the value of a few years spent in a botanic garden as part of a gardener's training has been long recognized and men graduated from these institutions fill major horticultural positions throughout the world.

The New York Botanical Garden's scheme of training is modeled after that in use at the Royal Botanic Gardens, Kew, England, with modifications to meet American conditions.

Young American gardeners are offered the opportunity of working at the Garden for a period of from two to four years. During this time they receive compensation sufficient to meet ordinary living costs. They are required to work forty-eight hours a week and to perform all the tasks incident to the position of gardener. Evening courses of instruction covering a two-year period are obligatory. These are given chiefly by members of the Garden staff and embrace the following subjects:

Science

Systematic Botany
Plant Morphology
Plant Physiology
Plant Breeding
Plant Pathology
Entomology
Soils and Fertilizers

Plant Culture

Fundamentals of Plant Growing
Outdoor Gardening
Trees and Shrubs
Greenhouse Practice

In addition to these courses the student gardeners have organized among themselves a debating society which meets throughout the winter semi-monthly to discuss papers on gardening subjects read by the members. During the summer frequent excursions are organized to visit other gardens and to collect material to be used in studies of the native flora. Under the guidance of a staff botanist one evening a week is also devoted to the study of practical dendrology.

Men appointed as student gardeners must be American citizens between twenty-one and twenty-eight years of age. They must be unmarried and must have completed high school and have served

at least two years in approved gardens or nurseries. To meet the demand of younger men seeking the opportunity of working at the Garden, though lacking the required background of practical experience, a limited number of apprenticeships are offered. Apprentices receive less compensation than student gardeners and are appointed for one year only with the possibility of an extension. They participate in all the activities of the student body, but are not eligible for certificates.

Since the inception of the scheme thirty-two men have been admitted as student gardeners and twelve as apprentices. Eight graduates of the student gardener course have been appointed to permanent positions at the Garden; three have left to take positions on private estates; two to establish businesses of their own; two to enter public park work; two to join commercial organizations, and two are at the Royal Botanic Gardens, Kew, England. Among the apprentices, seven subsequently became student gardeners, one entered Cornell University, and one accepted appointment to a private estate position. Our present student personnel comprises thirteen student gardeners and three apprentices.

In 1936 our program was broadened to permit an international exchange of gardeners. A selected student was sent to England to spend a year at Kew while a young Kew gardener received reciprocal opportunities here. A similar exchange went into effect during the present year. These exchanges were made possible by the furnishing of transportation costs by outside organizations. In the first instance The English Speaking Union of the United States paid these expenses for the American student, while The English Speaking Union of the British Empire paid those of the Englishman. For the second exchange the National Association of Gardeners provided the necessary moneys for the American, and again The English Speaking Union of the British Empire met the expenses of the Kew man.

The value of exchanges along these lines has long been recognized and at Kew no less than seventeen student gardeners are from abroad. In 1936 Belgium, Canada, France, Germany, Holland, Italy, New Zealand, Norway, South Africa, Spain and Sweden as well as the United States were all represented on such exchanges by one or more men.

Five years of experience with our own training scheme has abundantly proved the value of the program. It has resulted in

attracting to the Garden young, keen, intelligent men, skilled in various phases of gardening and hailing from eleven States of the Union as well as from England. The benefits derived by the gardener from a period of training here extend far beyond the mere acquisition of horticultural knowledge and experience. Of inestimable value is the close association with other men of like age, ambitions, and ability; the contact with men of science, and the opportunities afforded by proximity to a great metropolis.

The gardener entering The New York Botanical Garden has the opportunity of becoming acquainted with a much greater variety of plants than is usually possible elsewhere. Often for the first time he begins to appreciate the significance of plant relationships and the importance of correct nomenclature. The processes by which the living plant grows and reproduces its kind are explained and the important truths of ecology brought to his attention. An understanding is gained of the methods followed by the plant-breeder, and a grounding is acquired in the sciences upon which disease and pest control is based. The student's horizon widens and he learns to approach his particular problems from a scientific viewpoint and to make use of the findings of science in his work. Yet throughout it all the supreme importance of performing efficiently and expeditiously the practical tasks connected with the care of a large garden must always receive his first attention.

The exchange of students with other countries aids in strengthening the bonds of international friendship and understanding. Benefits from such exchanges accrue not only to the men privileged to spend a period abroad but also to those who, remaining at their home institutions, work and live in association with the foreign students.

I believe that the success of the student-gardener training operating here is directly due to certain basic provisions of the scheme. Limitation of appointment to men who are already practical gardeners, coupled with the payment of a living wage, makes possible the rigorous selection of candidates. Removal of appointees who fail to maintain a high degree of efficiency ensures a consistently high standard. Acceptance of responsibility for, and day to day performance of, the work of the Garden increases ability and encourages resourcefulness.

T. H. Everett.

STUDENT GARDENER RECORD

The following have served as student gardeners and have satisfactorily completed their training period:—

Name	*Date of completion of student gardener training*
Thorlief Anderson	May 15, 1934
Jack Armstrong	May 2, 1937
John Borin	March 31, 1935
James Cahill	March 31, 1935
C. J. Collins	April 18, 1937
Martin J. Crehan	April 30, 1937
Stephen G. Cutting	July 15, 1937
Donald Dodds	December 31, 1935
M. Truman Fossum	July 31, 1937
Albert Gebert	March 31, 1935
George H. Lupton	October 24, 1936
P. J. McKenna	May 15, 1934
Franklin C. Moore	June 16, 1936
Frank O'Regan	March 31, 1935
Stanley D. Pearson	May 31, 1936
Howard Swift	April 22, 1936
Joseph W. Tansey	September 30, 1935
Robert Weidner	August 31, 1937
Walter Wolney	March 31, 1935

The following now hold appointments as student gardeners:—

Name	*Date of appointment*
John M. Bachmann	October 1, 1937
A. Bisaillon	July 12, 1937
Edward J. Brennan	April 1, 1936
Samuel Bridge	July 1, 1937
Fraser MacCartney	June 3, 1936
Francis George Mackaness	April 20, 1937
George McGregor	May 1, 1937
Donald J. Moss	April 1, 1937
John T. Moss	October 1, 1937
C. Nicholas A. Pecora	May 3, 1937
Ralph Pinkus	May 17, 1937
Donald Samson	July 1, 1937
Ronald B. Townsend	April 1, 1937

SOME NEW HYBRID LILIES OF PROMISE

New hybrid lilies have recently been produced which seem to have considerable horticultural value. Their seed parent was a plant of the so-called *"Lilium sulphureum"* and the pollen parent was evidently a plant of *Lilium Henryi.*

The several hybrids of the first generation which were grown resemble *L. Henryi* strongly in habit of growth, and the general type of flower, as shown in the accompanying photograph, is also somewhat similar. But the flowers are larger than those of *L. Henryi,* the petals are broader, more spreading and more smooth, and the color is a buff or apricot with some tinges of orange. Bulbs of this first generation were offered to the trade in the 1937 catalogue of John Scheepers Inc., under the name *Lilium* Theodore A. Havemeyer. A photograph of a flower of one of these lilies has recently appeared in the *Gardener's Chronicle* (August 28, 1937) with the statement in the previous issue that the plant had been given an Award of Merit by the Royal Horticultural Society. The flower is there described as "creamy old-ivory color with three or four buff longitudinal lines and marked with rosy amber on the basal half of the segments. There are green blotches at the base and the flowers have brown anthers."

During the present summer about a dozen plants which were grown from the seeds of the first generation hybrids flowered in the garden in which they originated. Several of these plants resembled *Lilium Henryi* in the character of the foliage and in the habit of growth, but they were quite variable in respect to the shape, size, and coloring of the flowers. One plant had bell-shaped flowers that were almost white on the outside but yellowish in the throat. The others had widely open flowers with petals spreading or recurving. The prevailing colors were pale buff or pale orange but in some the orange shades of coloring were quite strong in the face of the petals and in addition some had delicate markings of darker colors distributed as penciled dashes rather than as dots. There were a few plants with flowers of almost clear shades of yellow. No two were exactly alike in the shape, size, and coloring of the flowers. Some plants of both the first and second generations made stem bulblets, which is a consistent character of *Lilium sulphureum.* The plants are still young and hence one cannot now state what the habit eventually will be.

The history of these hybrids is as follows. In the summer of 1933 Mr. Tom Barry, a dairy farmer and plant grower living near Lambertsville, N. J., grew plants of several species of *Lilium*. He states that he placed pollen of a plant of *Lilium tigrinum* on the stigma of a flower of *Lilium sulphureum*. A capsule developed and with the approach of freezing temperatures the stem was cut and the capsule was ripened in a greenhouse by Mr. A. C. McLean, who is the County Agent for Mercer County, N. J. The seeds which were obtained were divided between Mr. Barry and Mr. McLean and the latter gave his seeds to his brother, Dr. Forman T. McLean, who has reared one plant from this seed. In 1937 this plant stood about 7½ feet tall and was very much like a robust plant of *L. Henryi*. But its flowers were very similar to those of the other first generation hybrids which Mr. Barry reared.

None of these hybrids, either of the first or of the second generation, has exhibited any convincing evidence in its appearance that a plant of *Lilium tigrinum* was the pollen parent. On the other hand, the resemblance to *L. Henryi* is evident. Mr. Barry states that he had plants of *L. Henryi* in his collection in 1933, and it seems certain, at least to the writer, that an insect transferred pollen from a flower of *L. Henryi* to the flower of *L. sulphureum* and that this pollen functioned rather than the pollen transferred by Mr. Barry. The seedlings obtained are certainly to be considered true hybrids. The F_1 plants are rather uniform in character and very different from the seed parent. If there had been merely induced apogamy, which does occur in certain lilies, these seedlings should resemble the seed parent. The F_2 plants show wide variations, a situation to be expected when there is fertilization in true hybrids.

Further experimental tests are being made for hybridization between types of *Lilium tigrinum* and *L. Henryi* with *L. sulphureum*. Dr. Forman T. McLean reports that in 1936 he applied pollen of *L. tigrinum* to pistils of *L. sulphureum* but obtained no capsules. In numerous fully controlled pollinations the writer has this year used pollen of *L. sulphureum* on plants of *L. tigrinum* and *L. Henryi,* all of which failed to produce in the slightest degree any capsule development. Reciprocal pollinations have been made but the results are not yet fully indicated. *Lilium Henryi* exists in numerous clones and in many individuals grown directly from seeds. In *Lilium tigrinum* there are several distinct triploid clones

The flowers of one of the hybrids called *Lilium* Theodore A. Havemeyer. About one-third natural size. From a photograph supplied by Mr. John T. Scheepers.

and also numerous seedlings of the diploid strain, all of which belong in the species. It is possible that only one clone of *L. sulphureum* is in general culture. Adequate tests are being made to determine whether any type of *Lilium tigrinum* will

hybridize with *L. sulphureum*. Possibly *Lilium sulphureum* and *L. Henryi* will hybridize only when the former is the seed parent.

The production of these hybrids by Mr. Barry will no doubt stimulate further hybridization between other members of the section with trumpet flowers (Leucolirion) and species which have nodding reflexed flowers (the Martagon section). The so-called *L. myriophyllum,* in which Wilson[1] placed *L. sulphureum* as designated by Baker[2] (which is characterized by long, trumpet-shaped, pale yellow flowers), includes individuals in which great variation may be found. *L. Henryi,* whose reflexed perianth segments are ordinarily of rich yellow spotted with brown, also is subject to variation, especially in color. Hybridizations between these somewhat different and diverse types may therefore be expected to result in forms distinct from those already obtained. The members of both the first and the second generations raised by Mr. Barry seem able to produce seeds and hence may be utilized in breeding.

These hybrids show many interesting intergradations and modifications in respect to form, shape, size, and color of flowers and at least several of them are so distinctly new and desirable that they deserve to be cultivated under individual clonal names.

A. B. Stout.

PLANT HUNTING AT HOME FOR FRUIT GROWERS

Any fruit grower can be a plant explorer at home, according to information sent out a year ago by the United States Department of Agriculture. The improvement of fruit varieties by bud selection is passing out of the experimental stage, the Department reports, and what the fruit industry needs now is for thousands of growers, instead of a few, to be alert to the possibilities of their trees.

In plant hunting by bud selection, the search is for superior strains that result from "sports" or mutations in the buds of bearing trees. These mutations may occur anywhere and in almost any kind of fruit. A. D. Shamel and C. S. Pomeroy of the U. S. D. A., who have done much experimental work in this line.

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[1] Wilson, Ernest H. The Lilies of Eastern Asia. 1925.

[2] Baker, J. G. in Bot. Mag. *t.7257* (Oct. 1, 1892). The name *L. sulphureum* is in common use for this type today.

have found sports in trees growing in both favorable and unfavorable situations.

Most cultivated fruits are kept true to variety by budding or grafting. In their work in the California orange groves, Shamel and Pomeroy noted that occasionally there were differences in the fruit produced on trees of the same variety, or even on a single tree. One branch might ripen its fruit earlier than other branches, or bear fruit larger or sweeter or thinner-skinned. If buds from such a branch are propagated and the budded trees show the same characters, it means that the original branch was a true "sport." By selecting and propagating from the desirable mutations, it is possible to take advantage of strains having general resemblance to the standard, but differing in some respect that makes it a better fruit—better, at least, for some special purpose.

The experimenters also discovered that some strains are highly stable, rarely throwing sports. If these strains are used for propagation it helps to stabilize and standardize a variety, and to the standard, but differing in some respect that makes it a better standard market fruit.

To be a good bud hunter, the investigators say, a grower needs to train his eye to recognize automatically the detailed characters of his fruit variety and then be alert to distinguish the unusual, which may be desirable or the reverse. If desirable, the next step is to mark the twig or branch. Choice quality or high production on a branch may be the result of favorable soil, light, or water supply. But it may also be the result of a true mutation.

"To test this, bud or graft it on another tree, and if the superior quality reappears in the new growth, it is probable that the plant hunter has discovered a true mutation which may be valuable for propagation," says Mr. Shamel. He suggests a wise third step, which is to report it to the State Agricultural Experiment Station or to the U. S. D. A. for helpful assistance in further testing and in propagation if the new strain is a real improvement over existing varieties.

"This is a pioneer period of research along this line," says Mr. Shamel, "and the greater the number of intelligent fruit growers who undertake some phase of this fascinating work, the more rapid and valuable will be the results for the fruit growers of this country."

PREPARING ROSES FOR AN AUTUMN DISPLAY OF BLOOM

Hardly has the first flush of June bloom spent itself when preparations are begun for the second display of hybrid tea roses, which begins about mid-September and continues until ended by frost. The difference between the June bloom and that of late summer and fall is the rapidity with which the June flowering occurs. The entire garden bursts into bloom overnight, so to speak, and if the weather is hot and humid, as it usually is in June, the peak is soon reached and as quickly passes. The roses of fall, because of bright sunny days and cool nights, reach this maximum development gradually. The flowers therefore have more substance and better keeping qualities and retain their freshness over a longer period.

In preparing for a fall display, the task that immediately confronts the rose grower is that of maintaining his plants in health and vigor throughout the trying hot months of July and August. The heavy June crop of flowers which are forced to maturity so quickly, the subsequent and almost continuous production of bloom during the summer, and the attacks of insects and disease, are influences that place such an exacting drain upon rose plants that, unless measures are adopted to maintain their vitality, the roses will become so weakened from the struggle to survive that the fall crop of flowers will be almost negligible.

In discussing methods designed to uphold the strength of the roses, no hard and fast rules can be laid down. Local conditions must of necessity govern the procedure. The measures here outlined are those which obtain in our rose garden at The New York Botanical Garden and which have proved successful over a period of several years.

One of the most important operations during the entire growing season is the control of insects and disease. Incessant warfare must be waged to keep injury down to a minimum and constant vigilance is necessary if pests are to be kept in check. In early summer and at intervals during the growing season aphids are the most troublesome. These can be effectively controlled, however, by applications of Black Leaf 40 and whale-oil soap. Since a large quantity of the mixture is used at a time here, the proportions are one-half pint of Black Leaf 40, two pounds

William Orr, which is best in autumn.

A view in the rose garden.

Imperial Potentate, a single stalk.

SOME OF THE BEST

OF THE

FALL BLOOMING ROSES

AT THE BOTANICAL GARDEN

Southport, a new crimson rose.

Condesa de Sastago, an apricot-colored novelty.

Innocence, one of the finest singles.

Mme. Leon Pain, excellent at all seasons.

Mrs. Wakefield Christie Miller.

of whale-oil soap, and fifty gallons of water. Used at this strength the mixture does not injure either flowers or foliage and it gives a most effective control.

Fungous diseases are controlled by a prepared sulphur dust (Pomo-Green) applied methodically once a week. This is used principally to combat black-spot and mildew. Black-spot, that great enemy of the rose, makes its appearance approximately about mid-July. A short rainy spell, followed by a drop in temperature, provides the ideal conditions that pave the way for an initial infection. Once this has started, the war is on in real earnest. Every effort must be made to get the dust on the new growth before the spores of the disease are spread and have a chance to germinate. The most critical time for application is, if possible, just before a rain and again as soon as the foliage becomes dry; that is, immediately afterward, but *not* while the foliage is still wet. Constant vigilance and persistent applications of protective materials must be continually practised if the roses are to be kept in a healthy condition.

Immediately after the flowers of the June bloom have faded, the growths that have flowered are cut hard back. This is called by some "summer pruning." Carried out to encourage the production of new growth from the base, this cutting back results in more uniform plants, more vigorous growth, and better flowers.

About the beginning of July a program of summer feeding is launched. Alternate applications of tankage and liquid cow manure are given at weekly intervals. These have an almost instantaneous effect in inducing vigorous new growth. This feeding is continued until the middle of August. About midseason, or toward the end of July, the plants receive one application of acid phosphate to give the blooms good substance and color. This is usually applied to coincide with a rain, failing which it is necessary to water it in.

Continuous cultivation and stirring of the soil are practised, and every effort is directed to keeping the roses in a thrifty growing condition. Not the least of the operations performed in the rose garden is the constant removal of all spent blooms, which is done not only from the standpoint of tidiness and for sanitary reasons, but also to prevent seed formation with the consequent drain upon the plants' vitality.

All operations that tend toward the stimulation of growth cease about October 1. After this date, the plants are allowed to flower as they will. The more flowers produced at this season, the better are the chances for ripening of the canes before winter, thus insuring well matured wood for next year's growth.

After a killing frost, plants that have grown tall during the season have their tops reduced to within about two feet of the ground. This prevents their being whipped about by wind and having their roots loosened in wet soil. The final operation consists of hilling up around the base of the plants with gritty soil as a protection against repeated freezing and thawing. Soil is by far the best material for this purpose. Excess water is allowed to drain away and is not held around the plants as would be the case were leaves, strawy manure or like material used. These latter, by retaining moisture, aid considerably in the spread of canker and other fungous diseases.

Roses which are well cared for during the autumn months and given the proper protection for the winter have the best possible start for a heavy production of flowers the following year.

P. J. McKenna.

REPORT ON THE TABLE MOUNTAIN FIRE

(In the Journal for January, 1936, appeared a brief note about the fire which had raged on Table Mountain, Capetown, South Africa, on December 26, 1935. Because of the number of rare and endemic plants known on this mountain, reports as to their fate have been keenly awaited by botanists. R. H. N. Smithers, Collaborator of The New York Botanical Garden, accordingly interviewed Hugo Brunt, District Forest Officer at Capetown, and sent the information below for the readers of the Journal.)

From an outsider's point of view at the time of the conflagration on Table Mountain, it seemed impossible that any of the trees in the direct path of the fire could survive. It is remarkable how many have recovered, and today,[1] some fourteen months after, large patches of green can be seen dotted at intervals on the blackened slopes of Devils Peak.

Although it was reported in the Journal that the fire was ex-

[1] Mr. Smithers' letter is dated April 3, 1937.

tinguished by heavy rains, actually what did happen was that the wind changed and saved the situation. Had this not happened the fire would almost certainly have reached Groot Schuur, the Prime Minister's house on the Rhodes Estate, if not as far as Kirstenbosch, where incalculable damage would have been done. The ordinary fire-fighting squad was ably assisted in stemming the blaze by the Civil Service Batallion and by many civilians.

The Forestry Department has formulated a five-year plan to restore the greater part of the burnt-out area. The grove of *Pinus Pinaster* on the higher slopes has been removed to bring out the profile of the mountain. Planting of *Pinus insignis* is proceeding and all kloofs (ravines) are being planted with broad-leaved species, some exotic, some indigenous, in such a way that by contrast of color the esthetic value of the forest against the rock peaks will be enhanced.

To date some sixty acres have been planted, and considering the dryness of the year the work has been satisfactory. The main types being used are the keurboom (*Virgilia capensis*), silvertree (*Leucadendron argenteum*), Kaffir plum (*Harpephyllum caffrum*), Cape chestnut (*Calodendron capense*), poplars (various species), oaks (principally *Quercus palustris* and *Quercus Mirbeckii* [*lusitanica*]), and flowering gums (*Eucalyptus ficifolia*).

The indigenous flora burnt out is being replaced by color patches of Watsonias, Ericas, Leucadendrons, Leucospermums, Proteas, Cape Anemones, the blue flowers of *Disa graminifolia* and other herbaceous plants.

During November, as is usual after a fire, the higher slopes of Devils Peak were ablaze with masses of *Watsonia rosea,* a never-to-be-forgotten sight.

In all, I think we are lucky to have escaped so lightly from what was certainly the worst fire ever experienced on Table Mountain. At the time, press estimates of the damage ran as high as $1,000,000; now that there has been time to survey the matter more fully probably $25,000 would be a closer estimate.

The District Forest Officer is glad of the interest taken in this matter and would welcome correspondence from persons who are interested.

R. H. N. Smithers,
Collaborator.

A GLANCE AT CURRENT LITERATURE*

"Clematis for the Northeastern States" is the title of a 16-page contribution by J. E. Spingarn in the Arnold Arboretum's *Bulletin of Popular Information* for July 28. After a brief historical note, the genus, species, and hybrids of *Clematis* are treated, then cultural directions and uses of different types are mentioned, with illustrations and informational lists of recommended sorts, and references to other literature on the genus.

* * *

A preliminary guide to the Greenbrier-Brushy Mountain Nature Trail in Great Smoky Mountains National Park has been prepared and published in mimeograph form under the auspices of the Smoky Mountains Hiking Club and the Department of Botany of the University of Tennessee. A comprehensive description of the trail is given from geological and ecological points of view; then the characteristic vegetation at eleven typical stations along the way is completely described.

* * *

The shipmast locust of Long Island and its superiority for erosion control are the subjects of two articles in the August *Journal of Forestry*. S. B. Detwiler deals largely with the history of the variety (*Robinia pseudoacacia rectissima,* often called "yellow" locust to distinguish it from the species), and Charles F. Swingle reports on experiments in its propagation.

* * *

Native shrubs of eastern United States which are used in gardens are the subject of an excellently illustrated article by J. Horace McFarland in *The New Flora and Silva* for July. In the same issue, E. H. M. Cox provides a key and describes 15 western American species of *Erythronium*.

* * *

Such familiar and well-loved plants as the waterlily, daylily, checkered lily and trout-lily, among others, are treated in *House and Garden* for August by Louise Beebe Wilder under the title of "Lilies in Name Only." A long list of these "courtesy lilies" is appended, with their common, botanical and family names.

In the same number H. E. Downer writes on how to raise primroses.

* * *

Flowers of Austria's Alps are pictured in a series of photographs in *Nature Magazine* for August. Most of them are familiar as garden plants in America, particularly rock garden subjects.

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* All publications mentioned here—and many others—may be found in the Library of The New York Botanical Garden, in the Museum Building.

How a garden of succulent plants can best be planned and started is told by H. M. Butterfield in *Desert Plant Life* for June. While the directions for culture apply to California, the principles of design and selection of types of plants as presented give useful information for any climatic region.

* * *

The Herb Journal, which has been published monthly since last October by Mrs. Rosetta E. Clarkson of 69 Old Orchard Road, New Rochelle, N. Y., continues to give abundant material of interest to herb gardeners, users of herbs in the kitchen, and readers who enjoy the flavor of garden writings of centuries past. Two summer numbers include eight pages on angelica (June) and information on harvesting herbs from the garden (July).

* * *

The *Arborist's News,* which is published by the National Shade Tree Conference, with L. C. Chadwick of Columbus, Ohio, as editor, keeps its readers informed of recent experiments with shade trees and of studies on their many problems. The June issue, for instance, contains a résumé of "Some Thoughts on Soil Conditioning" by John Tyler of Pennsylvania, pointing to the need of preparing soil for forest planting as carefully as for agricultural crops.

* * *

Among recent numbers of *Lexington Leaflets* by Stephen F. Hamblin is one on numerous herbs of the Rose family and one on native medicinal herbs. These leaflets, twelve of which are published from April through September, are products of the Lexington (Mass.) Botanic Garden.

* * *

An address which was recently given by Professor A. E. Murneek of the University of Missouri on "Recent Advances in Physiology of Reproduction of Plants" appears in *Science* for July 16.

* * *

Wild flowers which grow to the north of us and all across Canada to the Pacific coast are charmingly pictured by Viscountess Byng of Vimy, under the title "Of Some Canadian Wildings" in the June *Journal of the Royal Horticultural Society.* She writes of the flora as she observed it on going to Canada, when her husband was appointed Governor-General.

* * *

That original American, the white potato, is the subject of one of the Masters Lectures printed in the *Journal of the Royal Horticultural Society.* Redcliffe N. Salaman concludes his study of "The Potato in Its Early Home and Its Introduction into Europe" in the June 1937 issue.

CAROL H. WOODWARD.

REVIEWS OF RECENT BOOKS

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

A Garden in Westchester [1]

"Gardening on Nothing a Year" is a sprightly garden book although a bit staccato in its tone. It tells, as Mrs. Wilder explains in a foreword of charm and distinction, "how one small woman overcame her difficulties, . . . defeated the depression and *kept her garden.*"

In other words, the author's problem was not that of the week-end or suburban gardener who has to start and maintain a garden on "nothing a year", but the problem of a woman with a fine garden, a greenhouse, and all the other paraphernalia, who had to find an inexpensive way of maintaining it. This means, for one thing, that the reader learns about many plants which can be counted on to persist with a minimum of attention. Even the boxwood on the terrace somehow survives the winter without covering. But I *would* like to know how she makes cedars of Lebanon flourish in Westchester. In my Dutchess County garden I have long dreamt of having one, but with a succession of failures I have given them up in despair.

The author has an amusing affection for *Sidalcea.* I wonder why.

Excellent photographs illustrate Mrs. Griffith's text, while clever little drawings by Martha Powell Setchell bear witness to the rare sense of humor which the author possesses. The chapter on "Newcomers to Suburbia", for instance, strikes a good fresh note.

Amy Spingarn.

The Second Year [2]

When "The Gardener's First Year" appeared in 1936, it was announced by the publishers as a book especially for young people, but it was hailed by critics as a model of the sort of book that adults, as beginners in gardening, particularly need.

With "The Gardener's Second Year" Alfred Bates introduces his readers—who might also be called his students—to perennials for the garden. A third volume on trees and shrubs is promised for another year.

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[1] Griffith, Mary S. Gardening on Nothing a Year. 231 pages, illustrated. Hale, Cushman & Flint, Boston, 1937. $1.75.

[2] Bates, Alfred. The Gardener's Second Year. 278 pages, illustrated, indexed. Longmans, Green & Co., New York, 1937. $2.

As in the first book, the author continues his practical advice on how to learn how to grow plants. As the subject is more complicated, the treatment is less simple than in the first book. The information seems directed toward minds that are more mature as the young gardener of his first volume acquires age and experience. In addition to describing perennials and telling how to handle them in the garden, he begs the reader to insist on accuracy in plant names, and implores him, in getting new plants, to choose only those he has seen in bloom, and then to make sure that he is getting the exact variety he asks for.

With such sound advice as this, coupled with practical working directions and diagrams for the beginner, it is unfortunate that occasional slips have crept into the text. He refers to an herb as a plant which lives over from year to year (he has defined herb correctly in the previous book), and he speaks of the genus *Narcissus* as a group of plants in which the root is a bulb.

A descriptive list of some 200 attractive perennials is a valuable part of the book, because the author includes a number of worthwhile, lesser-known plants, as well as the long familiar garden flowers.

CAROL H. WOODWARD.

NEW BOTANY TEXT TITLE MISLEADING [3]

Reading the recent text by E. E. Stanford, "General and Economic Botany", leaves one with the feeling that the economic part of the title was an after-thought, although the author states in his introduction that he intended to emphasize the significance as well as the form and function of plants. His idea is admirable and would have been stimulating to elementary students, but examination of the text does not reveal sufficient divergence from pure morphology to justify any title other than "General Botany." As such it is a commendable volume.

Although modern physiological concepts of sap flow (p. 203) and nitrogen metabolism (p. 259) are mentioned, little or no suggestion of the physiology is stated. Similar extreme brevity is noted regarding absorption. Great detail is presented for root structure but the critical chemical composition and physiology of the root hair itself is restricted to one short paragraph.

Economic significance is stated in too many instances as "important" without the "why or how" or interesting facts. For example, on page 538, we learn only that maple sugar is almost wholly made from *Acer saccharum;* whereas one short additional paragraph could have stated what sugars and described the method of collection and preparation which is so stimulating to college freshmen. Page 534 informs us that the castor oil plant is a medicinal, but fails to state what part is used. Page 547 gives the species of

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[3] Stanford, Ernest E. General and Economic Botany. 675 pages, illustrated, indexed. D. Appleton-Century Co., New York, 1937. $4.

the cacao tree, but no statement of the part used, structure, or other information beyond the fact that it was cultivated by the Aztecs and Incas and its culture spread. Page 573 tells the story of a major economic plant such as coffee in one and one-half sentences. I would not imply that any extensive discussion should be given to a large number of economic species, but space equal to that granted tobacco (pp. 571-2) and the peanut (pp. 526-7) could have been devoted advantageously to a considerable number of major medicinal, crop, and beverage plants to fulfil the preface statement of stimulating the scientific curiosity of the elementary student. Elimination of the many species mentioned by one or two sentences only—a style which generally dampens the interest of the freshman—would more than supply the necessary space for the stimulating development of the major economic plants without increasing the size of the volume.

In the volume's favor, may I emphasize that the morphology is well done and the illustrations are clear and critically fundamental. Excellent editorship is obvious in the absence of serious errors. The author should be congratulated upon writing a very readable exposition of the material presented. The publishers have produced an attractive example of text book workmanship.

R. H. Cheney,
Professor of Botany, Long Island University,
Brooklyn, N. Y.

Stapeliads [4]

Identification of a stapeliad has in the past been such a difficult and tedious task, that few were ever willing to undertake it, especially since herbarium material in this country is so poor that the final test of correctness by comparison with an authenticated specimen could not be made. The more unique succulents have recently been coming so rapidly to the fore in horticultural interest that it was an obvious necessity for the literature to be compiled into an accessible form, in order that the usual confusion of names resultant from such a situation might be forestalled. This tremendous chore has been painstakingly performed by Alain White and Boyd Sloane, and is done in such an attractive style and form that their work at once becomes a monumental classic in succulent literature, of immeasureable value to both horticulturist and botanist.

While a better artificial key to the species than the one in this work is still to be desired, the wealth of photographs and paintings and the careful descriptions of the taxonomic characters of the plants are so well done that identification is a greatly simplified matter.

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[4] White, Alain, & Sloane, Boyd L. The Stapelieae. Three volumes, 1184 pages, 39 colored plates, 1,250 photographs and drawings, indexed. Abbey San Encino Press, Los Angeles, 1937. $12.50.

It is very possible that one might find disagreement with the generic concepts as presented, but on the whole so little is known in the United States of this group of plants that criticism on this point would be unfair.

The inclusion of biographical sketches of the men and women whose names are associated with these stapeliads, and the historical sketches as well as the cultural suggestions are original and interesting additions to this type of work, as they have the effect of bringing the reader nearer to the understanding of the problems involved.

All manner of credit is due to the authors and their collaborators for the production of this work, which is a prime necessity upon the shelf of anyone seriously interested in growing these curious succulents. It is to be hoped that in the near future someone will produce works of a similar nature upon mesembryanthemums and euphorbias, as they are also much needed.

E. J. ALEXANDER.

A STUDY OF GOURDS [5]

To pick up a new book by Dr. Bailey is always a satisfaction, because it is bound to be written with authority and clarity and with an evident love for things that grow. "The Garden of Gourds" tells us in simple language of the morphology, the methods of cultivation, diseases and pests, how to deal with them, and provides a key by which we may classify the gourds of the various genera.

There are many oddities in this group which have a special appeal. The turban squash Dr. Bailey considers to be a kind of "navel" squash. He also describes, among others, the snake, cucumber, the bottle and dipper gourds, the dishcloth gourd, the finger and Maranka gourds, and the squirting cucumber, which when detached from the plant after ripening has the surprising faculty of forcibly ejecting its contents from the stem end on the slightest touch. Each type of gourd described is illustrated with pen and ink sketches. Since the color of gourds is one of their most attractive features, it is unfortunate that the plates could not have been colored.

Dr. Bailey brings out the point that evolution among the cucurbits seems to be toward permanent separation of the sexes and assurance of cross-pollination. In his historical notes the conclusion that native summer squash and pumpkin are not known comes as somewhat of a surprise to the average person. At the same time, respect for the wild Texan gourd, from which it is thought that the other forms might have originated, is heightened.

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[5] Bailey, L. H. The Garden of Gourds. 134 pages, illustrated, indexed. Macmillan Co., New York, 1937. $2.50.

It is a pleasure to find in a book for public circulation facts of a scientific nature, as well as practical, told in such a simple way and with such apparent relish.

W. M. PORTERFIELD.

NOTES, NEWS, AND COMMENT

Just before leaving Georgetown, British Guiana, September 18, Dr. A. C. Smith, who is botanist with the American Museum Terry-Holden Expedition, wrote of the party's plans for starting into the interior. In a letter to Dr. H. A. Gleason he said:

"The two boats are finished and have been duly launched and christened the Schomburgk I and Schomburgk II. Each is about 36 ft. long and has a beam of about 6 ft. and will carry up to 8,000 pounds. They are similar to the balata boats and each has a Johnson 22-horsepower engine. These are being sent around to Bartica Saturday and we hope to leave upriver Monday. Our supplies are all ordered and being packed. We hope to reach Dadanawa in four weeks, as the rivers are said to be still high enough not to give much trouble. Melville is arranging our transport from that point, and we expect to follow a route which was taken by the boundary commission a couple of years ago, as follows: from Dadanawa overland to the Kassikaityu river, which can be followed down to the upper Essequibo, which is then navigable for corials to a point within two days of the height of land of the Akarais. Melville is getting together Indians and corials for this part of the trip. We are taking from Georgetown twenty-eight Indians of the Maruka tribe of the Bomeroons, in addition to negro captains and bowsmen. With luck we should reach the proposed base camp by the first part of November. We hope to broadcast once from the Rupununi region, perhaps about Oct. 15."

* * *

Professor Aaron J. Sharp of the University of Tennessee visited the Garden during August to pursue his studies of mosses. From Duke University during the month came Dr. Lewis E. Anderson, also working on mosses, and Dr. H. L. Blomquist, for investigation of some grasses.

* * *

Other end-of-the-summer visitors at the Garden included Dr. H. M. Jennison of the University of Tennessee and Great Smoky Mountains National Park, Dr. Theodor Just of Notre Dame University, Editor of *The American Midland Naturalist*, and R. T. Wareham of Ohio State University, who came to work on mosses.

Dr. Adriance Foster of the University of California spent several days at the Garden in July, as did Dr. Robert E. Woodson, Jr., of the Missouri Botanic Garden, J. W. Stacey of the California Academy of Sciences in San Francisco, and Dr. Rogers McVaugh of the University of Georgia, who is working on the North American Lobeliaceae. Dr. George Goodman of the University of Iowa spent August at the Garden studying certain genera of the Polygonaceae.

Other botanists who registered in the library during the summer include: Dr. E. D. Merrill, Jamaica Plain, Mass., Louis C. Wheeler, Cambridge, Mass., Dr. Ernst J. Schreiner, New Haven, Conn., Prof. H. M. Fitzpatrick and W. Lawrence White, Ithaca, N. Y., Arthur N. Leeds, Philadelphia, Pa., Marie B. Knauz, Pittsburgh, Pa., R. Kent Beattie and E. H. Walker, Washington, D. C., John V. Watkins, Gainesville, Fla., Dr. Stanley A. Cain, Knoxville, Tenn., J. J. Otero, San Juan, P. R., Prof. H. S. Jackson, Toronto, Ont., Genkei Masamume, Taiwan, Formosa, and Kogo Togashi, Morioka, Japan.

* * *

Recently there has been added to the Library of The New York Botanical Garden sixteen volumes of Verkade's Albums on natural history and landscape of Holland, all illustrated with many colored figures. These were sent in exchange for the early volumes of *Mycologia,* negotiations for which were started during Dr. F. J. Seaver's visit to Holland as delegate to the International Botanical Congress held in Amsterdam in the summer of 1935. Twenty-two volumes of this work have been published, and it is expected that the other six volumes will eventually be obtained. One of the volumes is devoted exclusively to mushrooms, and contains 136 excellent colored figures of species, most of which are common in Europe and America. The remaining volumes are devoted to different groups of plants, and other phases of the natural history of that country. This is a valuable acquisition since the volumes could not be purchased except by special arrangement. The sixteen volumes received were obtained by Dr. W. J. Lutjeharms, Assistant in Chief in the Rijksherbarium at Leiden, Holland.

* * *

Dr. Fred J. Seaver attended the mycological foray at Dartmouth College, Hanover, New Hampshire, on August 26-28. This was the annual summer get-together of the Mycological Society of America. The time was devoted mainly to field expeditions and laboratory study.

* * *

William Fitzpatrick, who for the past three years has been special motorcycle patrolman at The New York Botanical Garden, died September 25 from injuries received two nights before in a highway accident. Returning from an evening class at Fordham University, he collided with a passenger car near the foot of Bronx River Parkway. He was 22 years old, and had been known for his effective work as patrolman in the park.

THE NEW YORK BOTANICAL GARDEN

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Established as a privately endowed institution, aided partially by City appropriations, The New York Botanical Garden is dependent for its progress largely upon benefactions and memberships. Through these means, though young as botanical gardens go, it has become the third largest institution of its kind, its library, herbarium, and horticultural collections ranking among the finest and most complete in any country.

Membership in The New York Botanical Garden, therefore, means promotion of scientific research in botany and the advancement of horticultural interests. Scientifically, the Garden is able to serve as a clearing-house of information for students and botanists all over the world; horticulturally, it often serves as a link between the plant explorer or breeder and the gardening public.

Through memberships and benefactions, provision is made at the Botanical Garden for the training of young scientists and student gardeners; hundreds of new books are added annually to the library, which is open daily to the public for research and reading; free exhibits are maintained in the museum, the greenhouses, and gardens, and lectures, courses, and free information in botany and gardening are given to the public.

Each individual member of the Garden receives:

(1) A copy of the Journal every month.

(2) A copy of Addisonia twice a year, each number illustrated with eight colored plates of unusual plants, accompanied by complete descriptions and other pertinent information.

(3) A share of surplus plant material of interesting or new varieties whenever it is distributed.

(4) Announcements of special floral displays at the Garden from season to season.

(5) Credit, to the extent of the membership fee paid, toward courses of study offered by the Garden.

A limited number of garden clubs are accepted as affiliates. The privileges of affiliation are a subscription to the Journal, announcements of displays, a specially conducted tour of the grounds and greenhouses, and a lecture once a year by a selected member of the staff.

Fellowships or scholarships for practical student-training in horticulture or for botanical research may be established by bequest or other benefaction either in perpetuity or for a definite period.

The classes of membership and types of benefaction are as follows:

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Contributions to the Garden may be deducted from taxable incomes. The following is a legally approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ————————.

Conditional bequests may be made with income payable to donor or any designated beneficiary during his or her lifetime.

All requests for further information should be addressed to The New York Botanical Garden, Bronx Park, New York, N. Y.

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

NOVEMBER, 1937

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THE BOTANICAL GARDEN'S BOOKS

Professional botanists and amateur nature students are both served by the textbooks and manuals of The New York Botanical Garden. Few manuals, for instance, have won such long-continued approval among members of both groups as the classic three-volume "Britton & Brown."

This "Illustrated Flora" was the first large American work to show an illustration of every species of plant described.

For beginners in botany—those who are still in the class of nature students—H. A. Gleason's "Plants of the Vicinity of New York" meets a special need, for by means of this book the most inexperienced amateur can identify in a few minutes' time any common flower which grows wild within 100 miles of New York.

For students of middle western plant life, The New York Botanical Garden offers P. A. Rydberg's "Flora of the Prairies and Plains of Central North America"—a monumental work describing nearly 4,000 species of ferns and flowering plants of the prairie states.

The plant life of Bermuda, from the fungi and algae to the spermatophytes, or flowering plants, is described in the "Flora of Bermuda" published in 1918 under the authorship of a group of experts headed by N. L. Britton. No work, either popular or technical, has yet superseded this large illustrated volume. The same is true of Albert Schneider's "A Text-book of General Lichenology."

In addition to these books which are handled directly by the Botanical Garden, members of the staff have made important independent contributions to botanical literature. Chief among them are Dr. John K. Small's numerous volumes: "Manual of the Southeastern Flora," "Ferns of the Vicinity of New York," "Ferns of Florida," and (now in press) "Ferns of the Southeastern Flora."

Results of some of Dr. A. B. Stout's research on *Hemerocallis* have appeared in a book entitled "Daylilies" published in 1934. "The North American Cup Fungi" by F. J. Seaver is the outstanding work on the Operculates.

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WILLIAM J. ROBBINS COMES TO THE GARDEN AS DIRECTOR

Dr. William J. Robbins, Professor of Botany, Chairman of the Department of Botany, and Dean of the Graduate School of the University of Missouri, has been appointed Director of The New York Botanical Garden.

In a career which has taken him into many American research and educational institutions and into the laboratories of nearly every country in Europe, Dr. Robbins has won a reputation as a plant physiologist as well as an executive.

Born in North Platte, Nebraska, February 22, 1890, Dr. Robbins grew up in Pennsylvania, graduating from the Bethlehem, Pa., high school and attending Lehigh University in Bethlehem. After receiving an A.B. degree there in 1910, he remained to serve one year as teacher in biology. In 1911 he went to Cornell University for graduate study, beginning work for his doctorate under Dr. B. M. Duggar and completing it under Dr. Lewis Knudson, receiving his Doctor of Philosophy degree in June, 1915. From 1912 to 1916 he taught plant physiology at Cornell and assisted Dr. Duggar in a course at Woods Hole, Mass., during the summers of 1912 and 1913. He left Cornell in 1916 to become Professor of Botany in the Alabama Polytechnic Institute and Plant Physiologist at the Experiment Station there.

In 1918 he served as Second Lieutenant in the Sanitary Corps of the United States Army, spending three months of the time in the Army Laboratory School at Yale University. Upon leaving the army he accepted a position as Soil Biochemist in the

Bureau of Plant Industry, United States Department of Agriculture, in the laboratory of Dr. Oswald Schreiner.

He was appointed Professor of Botany and Chairman of the Department of Botany at Missouri in 1919. In the summer of 1924 he spent three months working with Dr. E. T. Bartholomew on internal decline, or endoxerosis, of lemons, at the Citrus Experiment Station of the University of California.

Beginning in August, 1928, he was associated for two years with the European office of the Rockefeller Foundation, assisting in the fellowship program, a duty which took him into the scientific laboratories of all European countries, including Russia, with the exception of Spain, Portugal, Greece, and Turkey.

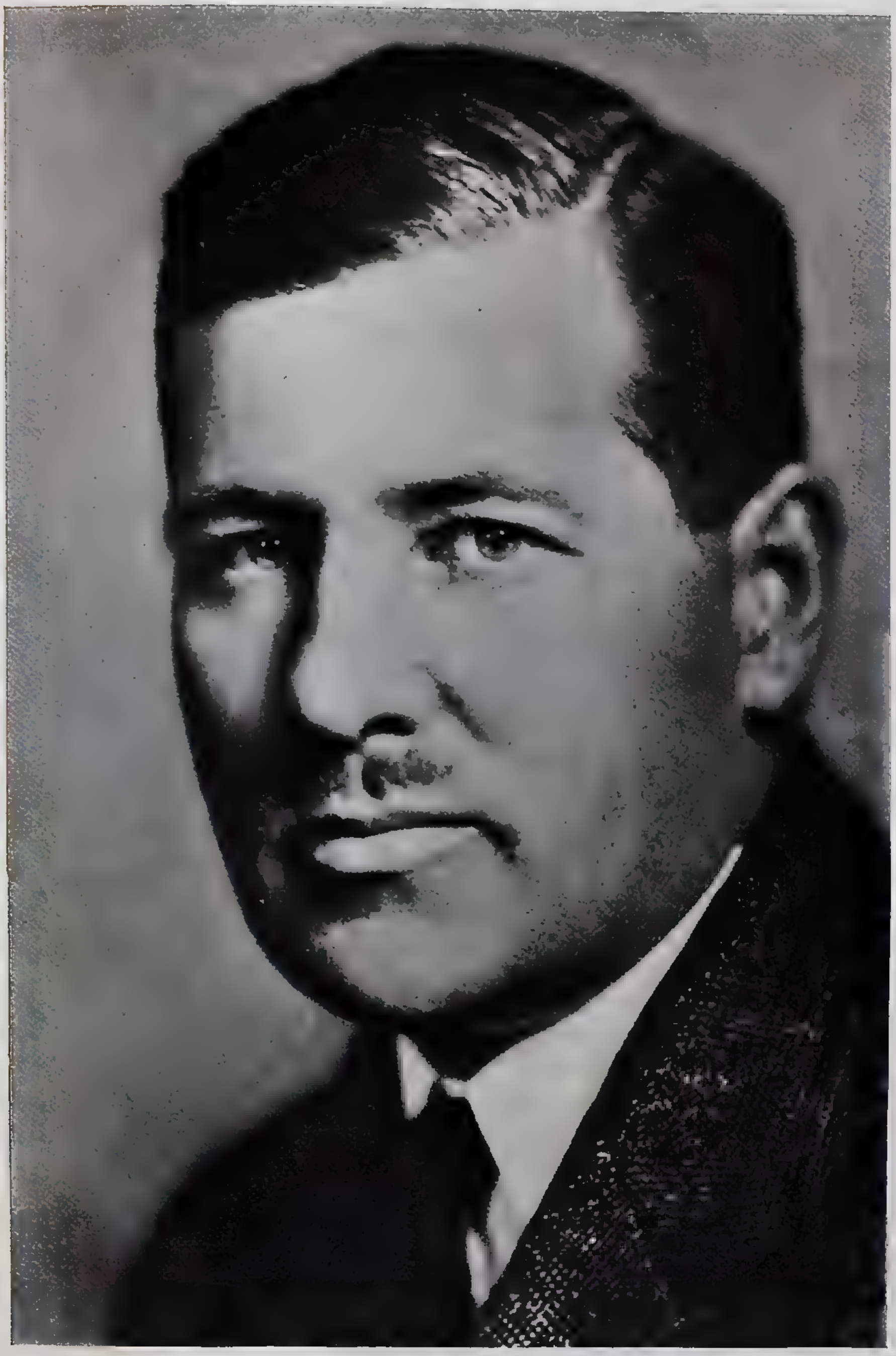
He was appointed Dean of the Graduate School of the University of Missouri in 1930 and served as Acting President of the institution from September 1933 to May 1934. He has been a member of the staff of the Marine Biological Laboratory for many years and was Chairman of the National Research Fellowship Board in the Biological Sciences from 1931 to 1937.

Dr. Robbins is a member of Phi Beta Kappa, Sigma Xi, Phi Kappa Phi, Gamma Alpha, and the honorary agricultural fraternity, Gamma Sigma Delta. He is also a Mason and a member of the Presbyterian church. This year the honorary degree of Doctor of Science was conferred upon him by Lehigh University.

Mrs. Robbins, who was formerly Christine F. Chapman of Springfield, Mass., is also a botanist and a member of Phi Beta Kappa. At Wellesley, from where she was graduated in 1912, she majored in botany under Dr. Margaret Ferguson. In 1914 she received an M.A. degree from Cornell in plant physiology and then returned to Wellesley to teach in the Botany Department. The following year she was married to Dr. Robbins.

They have three sons: Frederick Chapman, who received his A.B. from Missouri last year and is now completing his second year of medicine; William Clinton, who will graduate from the high school at Columbia, Missouri, next spring; and Daniel Harvey, who will enter senior high school in the fall.

The results of Dr. Robbins' more than twenty years of research have been published in some forty articles which have appeared in the *American Journal of Botany, Botanical Gazette, Science, Soil Science,* and other periodicals. In collaboration with H. W.



William J. Robbins

Rickett he has written "Laboratory Instructions for General Botany" and "Botany, A Text-book for University and College Students," both of which were published by D. Van Nostrand & Company. During the current year nine articles have appeared under his authorship, including: "Effect of 3-indole Acetic Acid on Cell Walls of Stem and Root" with John R. Jackson in the *American Journal of Botany;* "Vitamin B, and the Growth of Excised Tomato Roots" with Mary A. Bartley in *Science;* "Plant Hormones" in *School Science and Mathematics,* and "The Assimilation by Plants of Various Forms of Nitrogen" in the *American Journal of Botany.*

SARAH H. HARLOW, LIBRARIAN, RETIRES

After twenty-five years of service as Librarian for The New York Botanical Garden, Miss Sarah H. Harlow retired from active duty the end of October.

Trained first as a botanist, Miss Harlow came to the Garden to work as library assistant in July 1911, then after studying at the Library School at the New York Public Library, she was appointed Librarian in January 1913. Dr. John Hendley Barnhart, who had been Librarian since 1907, was given the newly created post of Bibliographer.

Born at Florida, New York, of English and Welsh ancestry, Miss Harlow prepared for college at Northfield Seminary, then studied at Wellesley College, majoring in botany, and was graduated in 1891 with the degree of Bachelor of Science. The following winter she went to Oregon to do private teaching on a ranch, remaining there until April 1893. In the fall she started for Turkey where for two and a half years she taught in the American Collegiate Institute in Smyrna. While there she traveled extensively across central Europe during vacation periods. Later, during the summer of 1931, she visited the Scandinavian countries.

After her return from the American school in Turkey she taught in a private school in Tuxedo Park, New York, until she felt ready to begin work for a master's degree. In the fall of 1899 she registered at Columbia and spent two years in concentrated study of botany, doing her research at The New York Botanical Garden. She studied especially mycorrhiza under Dr. D. T. MacDougal,

who was then a member of the Garden's staff, and Pteridophytes under Prof. L. M. Underwood, whose herbarium now is at the Botanical Garden. In 1901 Miss Harlow was granted an A.M. degree by Columbia University.

Private teaching with occasional periods of traveling occupied the next few years, until Miss Harlow came to the Garden in 1911. Since her appointment to the staff the library has nearly doubled in size, increasing from 24,000 bound volumes at the beginning of 1913 to 45,000 at the present time, and overflowing its original quarters until it now occupies much of the adjoining office and laboratory space as well as an entire room on the second floor. Miss Harlow has presided over this period of growth which has made the Garden's library the largest combined horticultural and botanical reference library in the country.

In her retirement, Miss Harlow plans to enjoy the many advantages of the metropolis—museums, concerts, theatres, parks, and stores—which she has found little time to visit during the years that she has been working.

Her sister, Miss Martha Harlow, who has been employed in the library for a number of years, is retiring on December 1st.

ELIZABETH C. HALL BECOMES LIBRARIAN FOR THE GARDEN

Coming from the Horticultural Society of New York, where she has been Librarian for the past seven and a half years, Miss Elizabeth C. Hall became Librarian for The New York Botanical Garden on November 1, to succeed Miss Sarah H. Harlow, who retired October 30.

Miss Hall received an A.B. degree from Radcliffe in 1921 and in 1924 a diploma from The School of Horticulture for Women at Ambler, Pa.

After graduating from The School of Horticulture she obtained a position as horticultural occupational therapist at the Pennsylvania Hospital for Mental and Nervous Diseases, where her work consisted in teaching gardening, greenhouse culture, and nature study to the patients and to the nurses and attendants who accompanied the patients.

In November 1925 she began work as a substitute in the New York Public Library and in 1926 was appointed to the staff of the Riverside branch. Granted a leave of absence from September 1927 to June 1928, she took the one-year graduate course at the School of Library Service at Columbia University, there being granted a B.S. degree. Upon completion of this work she returned to the New York Public Library to remain until April 1930, when she resigned to become Librarian for the Horticultural Society of New York.

She is a member of the Special Libraries Association and of the Society for the Libraries, New York University.

CHINESE VEGETABLE FOODS IN NEW YORK

The cosmopolitan nature of New York City is reflected not only in its many peoples but also in the food materials which inevitably follow them from their native lands. Not the least among these are the Chinese with their interesting array of fresh and dried foodstuffs. While bread and many other of our foods, including such confections as ice cream, today are being eaten by the Chinese, these people have never substituted our American vegetables for their own in their native cooking. Perhaps their accustomed vegetables, in representing to them the products of their native soil, constitute their one touch with their homeland. The feel of the land permeates their lives and philosophy, and the foodstuffs from their native land seem an important part of that essential atmosphere. This may explain the presence of these vegetables wherever the Chinese people are to be found.

During an investigation among the vegetable markets in New York's Chinatown last August, nearly forty different kinds of food from plants were found. The list of these foods will serve to show that the Chinese diet while native is varied and adequate. While this list is not exhaustive, it includes most of the vegetables on sale either fresh or dried.

It should be noted here that these Chinese vegetables can be classified, according to Dr. Bailey,[1] into two groups with respect

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[1] Bailey, L. H. Some recent Chinese vegetables. Cornell Univ. Agr. Exp. Sta. Bull. 67: 177, 178. 1894.

to their introduction into North America. The first group comprises those vegetables which, like the cabbages, have been bought and sold in the American markets for many years, and second, those which have only recently been introduced by Chinese gardeners near the great cities and are unknown to American planters. As to the suitability of these Chinese vegetables to American tastes there is considerable division of opinion. Meyer [2] in his last letter to the Department of Agriculture in Washington before his death was quite doubtful and spoke thus: "It will take some time for the white race to acquire a taste for the very large majority of these products." On the other hand, Dr. Bailey is enthusiastic in promoting the use of most of the Chinese vegetables in the United States. Not only are they palatable but many of them are delicate enough to suit the most discriminating taste. Robert Fortune beginning with 1843 explored most of China for useful, especially edible, plants, and not only employed the knowledge he obtained for his own benefit and pleasure, but made it available to others. Europeans and Americans living in China find the native vegetables very good and use them all the time with their daily meals. The indigenous types of common vegetables are adequate in food value, and certainly are much cheaper than imports from America. Lettuce and asparagus, however, have been introduced into China because there is no native substitute for these two "foreign vegetables" which are so favored by the white population.

Below is a list of common Chinese vegetable foods[3] found in late summer in the native shops on Mott and Pell streets, New York City.

Roots, Tubers, Corms, and Bulbs

Pachyrhizus angulatus, Rich.	Yam bean tuber.
Pueraria Thunbergiana, Benth.	Kudzu tuber.
Ipomoea Batatas, Poir.	Sweet potato.
Nelumbium speciosum, Willd.	Lotus root.
Sagittaria chinensis, Sims.	Arrowroot.

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[2] U. S. D. A., B. P. I. Plant Immigrants, No. 142 (1918) p. 1286.

[3] Beginning with an article on rice, which follows here, a series describing these food plants, their culture and their uses, will appear intermittently in this Journal.

Sagittaria sagittifolia, Linn.	Arrowroot.
Colocasia antiquorum, Schott.	Taro.
Scirpus tuberosus, Roxb.	Chinese water-chestnut.
Zingiber officinale, Roscoe.	Ginger root.
Raphanus sativus, Linn.	Chinese radish.
Lilium Brownii, Poit.	Lily bulbs.

Shoots, Stems, and Leaves

Phyllostachys edulis, A. & C. Riv.	Bamboo shoots.
Brassica Pe-tsai, Bailey	Chinese cabbage.
Apium graveolens, Linn.	Chinese celery.
Portulaca oleracea, Linn.	Purslane.
Amarantus gangeticus, Linn.	Amaranth.
Thea sinensis, Linn.	Tea.

Cucurbits, Fruits, and Flowers

Luffa acutangula, Roxb.	Singkwa melon.
Luffa cylindrica, Roem.	Sua-kwa or dish-cloth gourd.
Momordica Charantia, Linn.	Leprosy gourd.
Benincasa cerifera, G. Savi.	Chinese preserving melon.
Lagenaria vulgaris, Ser.	Bottle gourd.
Diospyros Kaki, Linn.	Dried persimmon.
Prunus Mume, Sieb. & Zucc.	Dried plum.
Zizyphus Jujuba, Lam.	Dried Chinese date.
Canarium album, Raeusch.	Preserved Chinese olive.
Litchi chinensis, Sonn.	Lai-chi nuts.
Hemerocallis fulva, L.	Dried "lily" flowers.

Seeds and Grains

Oryza sativa, Linn.	Rice.
Ginkgo biloba, Linn.	Bak-koo, Ginkgo nuts.
Trapa bicornis, Linn.	Horned chestnut.
Nelumbium speciosum, Willd.	Lotus seeds.
Citrullus vulgaris, Schrad.	Watermelon seeds.
Glycine hispida, Maxim.	Soy bean.
Phaseolus Mungo, Linn.	Green Mung bean.
Phaseolus radiatus, Linn.	Red Mung bean.
Arachis hypogaea, Linn.	Canton peanut.
Dolichos sesquipedalis, Linn.	Yard bean.

Russula sp.	Mushroom.
Peziza auricula.	Dried wood-ear fungus.
Laminaria sp.	Kelp.
Nostoc flagelliforme, Burk & Curt.	Alga.

W. M. PORTERFIELD.

NEW DAHLIA HONORS DR. M. A. HOWE

One of the seedling dahlias which was most greatly admired by Dr. M. A. Howe during the 1936 dahlia exhibition at The New York Botanical Garden has been named "Director Marshall A. Howe" in honor of him as Director of the Garden. His death on December 24, 1936, occurred scarcely two months after the close of the dahlia season, which he had watched with interest despite his serious illness.

The newly named dahlia is of the formal decorative type, in its basic coloring a rich maroon which merges into violet at the tips of the rays. The blooms, which are prolific and long-lasting both on the plant and as cut flowers, are large and of great depth and are borne on stiff stems well above the foliage. The plant is of medium height, erect and sturdy, and the heavy dark green foliage is insect-resistant.

Raised by Albert Parrella of 3380 Ely Ave., The Bronx, New York City, the plant was donated by him to The New York Botanical Garden last year under the name of Seedling No. 500. Dr. Howe had watched its development admiringly. "Often when making a tour of the borders," says Dr. William G. Howe, who at that time was working with the dahlias, "I recall how he would pause before this seedling with its gorgeous bloom and say with a smile, 'This is outstanding.'"

It was after the flower had won a first prize at the New York Dahlia Show in September of this year that it was considered the one best fitted to name as a tribute to the late Director of the Garden. In October Mr. Parella received for this new flower a Certificate of Honor from the dahlia proving grounds at Experiment, Georgia, near Atlanta.

This is the second dahlia that has been named for Dr. Howe. In 1922 J. J. Broomall of the Eagle Rock Dahlia Farm in California announced a new pink decorative dahlia, "Dr. Marshall A. Howe," which he introduced in 1923.

RICE (ORYZA SATIVA)—THE WORLD'S GREATEST CROP

(No. 1 of a series on Chinese Vegetable Foods in New York)

Rice is the bread of the Chinese. It constitutes more than a third of their daily food and one half of the vegetable part of their diet if the menus of all classes are averaged. Moreover, it is the most ancient of agricultural crops. Rice is considered to be the world's greatest crop; furthermore, it is the surest and most dependable of the grain crops. It is not a purely Chinese food but from China we have the earliest reports of it and its name is fundamentally embedded in the language. One of the original radicals, those elements of which all Chinese terms are compounded, is the character Mi, meaning rice, a picture of a divided plot of ground with a plant in each.

Copeland [1] asserts that rice culture began in southeastern Asia. There is no direct historical evidence that it originated with the Chinese, but since rice was not a crop of the ancient Egyptians or Chaldeans, it is not probable that rice culture developed in Africa. Furthermore, the evidence of language points very strongly to its birth in China. Since long forgotten times the cultivation and use of rice have spread all over the world and countless varieties are known. In China alone more than a thousand varieties exist and in India 8,000 varietal names have been recorded.

Ssu Ma-ts'ien, a Chinese historian of the second century B. C., stated that the Emperor Shen-nung in 2700 B. C. sowed five kinds of "cereals": rice, wheat, millet, sorghum, and the soy bean (the soy bean, of course, being a legume and not a cereal, but included

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[1] Copeland, E. B. Rice p. IX. 1924.

Polished rice cooked and served in the Chinese style. The chopsticks are of bamboo.

in the Emperor's list of "grains" because of the similar uses to which it was put). In the ceremonies annually commemorating this event at the Temple of Agriculture in the Peking of old, the emperor, the princes, and the members of the boards all took part but only the emperor sowed the rice.[2] In the Chou-li, the book of ritual of the Chou dynasty written about 1100 B. C., it was stated that vegetable and animal food must be combined in specific ways and among these combinations it was postulated that rice is best suited to beef, while wheat goes with duck and millet with dog flesh.

The general term for rice is Tao, the grain as eaten being called Mi. The Pen-tsao, which is the ancient Chinese authority on *materia medica,* distinguishes glutinous and non-glutinous rice, also water rice and dry rice. The best rice of Peiping was once considered to be the non-glutinous type. Its extreme white-

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[2] Bretschneider, E. On the study and value of Chinese botanical works with notes on the history of plants and geographical botany from Chinese sources, p. 7. Foochow. 1870.

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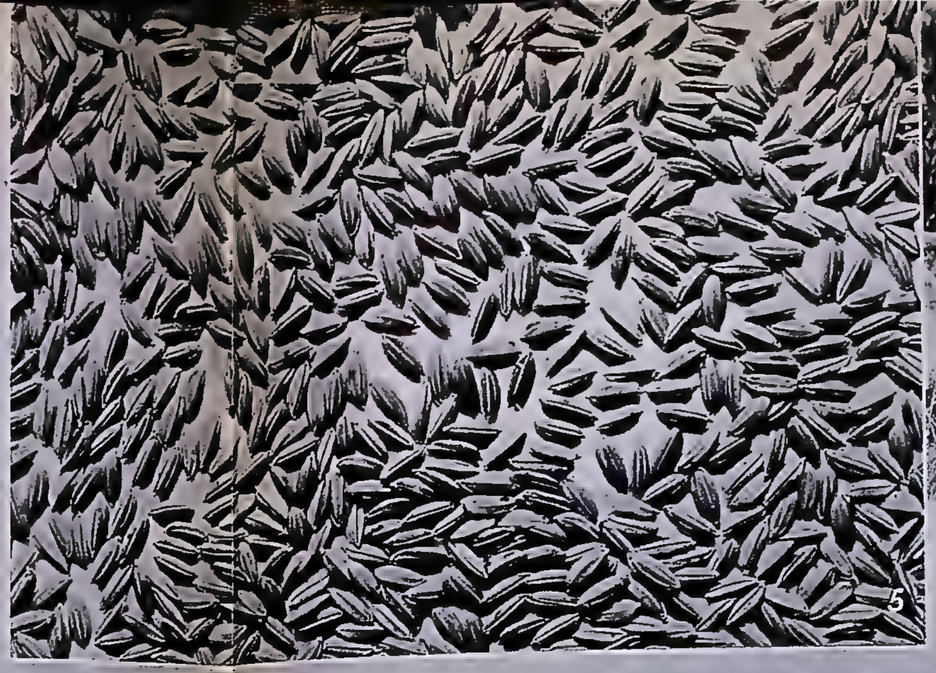
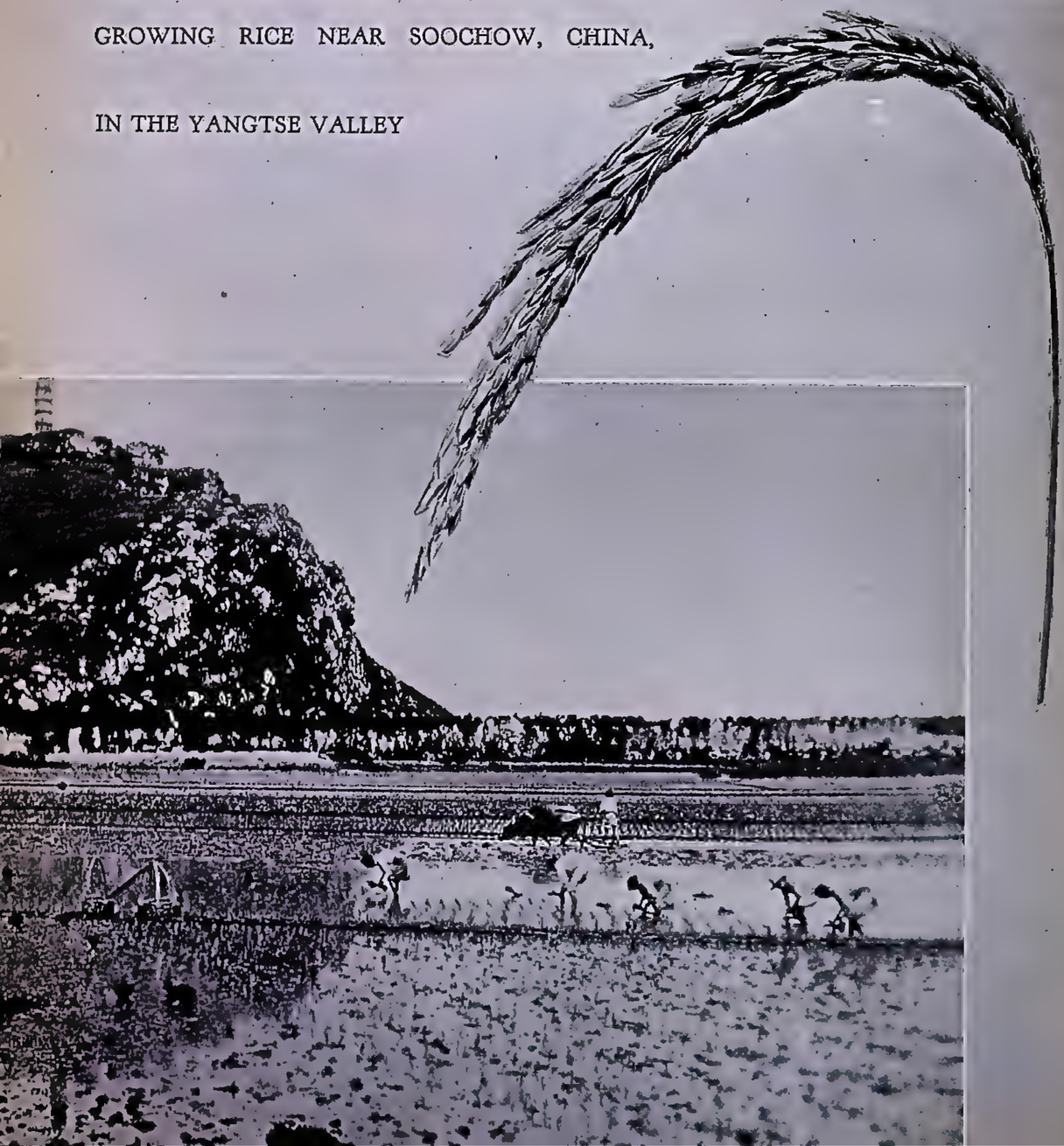


GROWING RICE NEAR SOOCHOW, CHINA,

IN THE YANGTSE VALLEY



1. *Harrowing the field.*
2. *Setting out young rice plants.*
3. *A stalk of rice in fruit.*
4. *Tao, the Chinese character for unhulled rice.*
5. *A modern improved variety of rice, unhulled.*
6. *Threshing rice by hand.*
7. *Winnowing rice in the courtyard of a farmhouse.*

(Photographs by courtesy of the American Museum of Natural History and the United States Department of Agriculture)

ness was a superior feature. The Chinese are very particular about their rice and when moving from one part of the country to another part they usually carry their own with them. When my *amah* went to Tsingtao in Shantung province with us in the summer she took along her rice from Shanghai.

Marco Polo on his memorable travels through China in the latter part of the 13th century recorded wheat and rice from the provinces south of the Yellow River. In the lower Yangtse Valley, particularly around Shanghai, a great deal of the land formerly occupied by rice paddies is now turned over to wheat and barley cultivation on account of the fact that there is an increasing demand for bread instead of rice.

Beyond the metropolitan area, however, the customs and methods of centuries prevail. The lumbering water buffalo slowly drags the ancient wooden plow through the flooded fields, following it later with the harrow. Finally bunch by bunch the rice seedlings, sprouted in some far corner of the field, are rhythmically jammed into the muck in rows. In the south two weeks or more after the first planting another planting in alternate rows may be made and a second crop raised. Those who have been fortunate in seeing the cinema production of "The Good Earth" saw all the processes of rice culture accurately depicted. The ancient flails are used to beat out the grains on the hard clay threshing floor and the wind is used to separate the chaff from the seed. The water from mountain streams is used to flood the paddy fields but is lifted from there to the upper terraces by water wheels turned by water buffalos who, wearing bamboo blinders, plod round and round all the day long.

Rice is bought in the markets as polished or unpolished rice. According to Chinese custom only the former is fit to eat; the latter is only fit for coolies. Those strange unfathomable barbarians from the west, to wit, the Americans and British, however, find that the unpolished rice is a much more healthful food. The reason is that polished rice eaten in too great quantities without greens is the direct cause of beri-beri. Many workers of the lower classes living in the cities are afflicted with this dietary disease. It has been found that polished rice lacks the anti-neuritic vitamin B. Eaten with the green vegetables which supply this vitamin or with the bran which is usually rubbed off in the polishing process, no symptoms of beri-beri develop. Unpolished

rice possesses vitamin B and some of the fat soluble A, whereas the polished rice has no vitamin value whatever [3]. This is of particular interest since the fuel value per pound (calorific) is 1.035. Calories are of little avail if the vitamins are lacking. A further analysis shows that the polished rice contains 12.3 per cent water, 9.0 per cent protein, .4 per cent fat, 78.0 per cent carbohydrates and .3 per cent ash.

In order to judge to what extent rice enters into the diet of the Chinese, M. E. Jaffa [4] in 1901 carried out an investigation of the foods eaten by three classes of San Francisco Chinese: the dentist representing the professional class; the laundryman representing the light inside worker; and finally the farmer representing the heavy outside laborer. By exact measure he was able to estimate the part rice played in these three classes of diet. His results were as follows:

Of the total food by the dentist's family 20.7 per cent was rice. Rice supplied 18.3 of the total protein, 0.8 per cent of the total fat, and 62.7 per cent of the total carbohydrate. In the group of laundrymen rice constituted 49.4 per cent of the total food; 48.8 per cent of the total protein was supplied by rice, 3.3 per cent of the total fat, and 93.9 per cent of the carbohydrates. The farmers' food consisted of 34.2 per cent rice; 34.1 per cent of the total protein was furnished by rice, 2.7 per cent of the total fat and 70.2 per cent of the total carbohydrates. The average of all three classes showed that rice constituted 34.8 per cent of the total food eaten and was responsible for 33.7 per cent of the total protein, 2.3 per cent of the total fat, and 75.6 per cent of the total carbohydrates.

While rice is the mainstay of Chinese diets, it does not appear at the wedding feast. It is a kind of Cinderella of foods. Sometimes it is served at the close of a feast as a sign that the end is at hand. After a large feast of forty bowls of other foods, the mere sight of a bowl of rice is enough to precipitate one's departure.

W. M. Porterfield.

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[3] Adolph, Wm. H. Practical dietetics or what to eat in 1924. Chin. Journ. Sci. and Arts 2: 79-90. 1924.

[4] Jaffa, M. E. Dietary studies of Chinese. U. S. D. A., O. E. S. Bull. 107 (2): 25-43. 1901.

AUTUMN IS THE TIME TO DIG THE GARDEN— AND DIG IT DEEPLY

(There is no gardening practice more beneficial to the plants than thorough digging of the ground. Those who have heard Mr. Everett speak are aware of the emphasis he places upon the importance of this task. The article below is taken from one of the lectures on "Fundamentals of Gardening" which he is delivering this season to the student gardeners and a group of other serious-minded growers of plants. The fall of the year, he points out, is the most efficacious time to do deep digging.)

Deep cultivation effected by the proper use of the spade and digging fork is perhaps the most important of garden tillage operations. The full possibilities of any piece of garden devoted to flowers or vegetables cannot be realized unless the soil is properly worked, and this implies thorough digging at periodic intervals.

The operation of digging—when it is correctly done—permits of the incorporation with the soil of manures and other humus-forming materials, and ensures the various weathering agencies the opportunity to bring their ameliorating influences to bear upon portions of the soil which otherwise would remain unchanged over long periods. By such means in course of time the depth of good soil is increased and plants grown on such ground find more plant food available and are able to send their roots deeper into the earth so that in time of drought they are far less likely to suffer.

No amount of fertilizer or manure can possibly take the place of actually turning over the earth with a spade or fork. It is interesting to note in passing that our word *manure* actually originated from the word *maneuver,* and *maneuvering* the soil in the process of digging certainly brings in its train many of the advantages which we usually expect to result from the application of manure. I do not mean to suggest of course that manure or fertilizer should be dispensed with, but rather to point out that without adequate working of the soil the greatest benefits can not be obtained from the application of these materials.

It has been my observation that, as a rule, far too little attention is given to this important phase of garden work, partly perhaps because the value of periodic digging is not fully realized, especially by the beginner, and partly because the practice of leaving until the spring all tasks connected with soil preparation

is too often followed, and in our climate the springtime is too short to permit of a thorough job being done.

The right season to commence spading operations, particularly on heavy soil, is just as soon as the ground can be cleared of crops in the fall, and work can be continued until hard frost makes further progress impossible, which in the region of New York is usually from the middle to the end of December. An extra week or two of profitable work can be gained by taking the precaution of covering the area to the depth of a few inches with littery manure, straw, corn-stalks, or some similar material before it is hard frozen and then removing this and turning it under as the digging proceeds. It is surprising how much can be accomplished in the eight or ten weeks available, and every square foot turned over means just so much headway gained on the rush of spring work. The labor expended represents an investment which will pay dividends in healthier crops and greatly increased yields. It is no exaggeration to say that many of the cups and blue ribbons awarded at summer flower shows are actually won by virtue of the work carried out the previous fall.

One important benefit of fall digging is that a greater portion of the winter rainfall is absorbed by the soil and is available for crops during the succeeding summer. This is of importance in regions (as New York) where water supply is one of the limiting factors of plant growth.

Single Digging

In its most simple form digging consists of turning the soil over to a depth of ten or twelve inches. This operation is technically distinguished as *single digging,* and it is one of the most important items of garden routine. Each year all ground which is vacant of plants should be treated in this way unless it is planned to do an even more thorough job by subjecting it to double digging or trenching. Except on a few soils the spade is a more suitable tool than the fork with which to dig for it permits of the bodily transference of soil from place to place, whereas with a fork little can be accomplished other than the breaking up of the soil in its place.

The first thing to do is to stretch a line across the plot where the beginning is to be made, then cut along the side of the line

FIGURE 1 shows the correct way to use a spade in digging the garden. Note the trench which is being maintained between the newly turned soil and the soil that has not yet been moved. Manure is spread on the ground in the process of being incorporated with the soil.

by thrusting the spade vertically into the ground with the foot to almost its full depth. The cut so made will form one side of a trench twelve inches wide and almost as deep. The excavated soil is placed close to where the digging will be completed. The purpose of the trench is to permit of the turning over of each spadeful of earth in a clean and expeditious manner, to make easier the burying of weeds and manure, and to facilitate the evening of surface irregularities as the work proceeds.

If the ground is being broken up for the first time and is covered with grass, or if weeds are abundant, the surface soil should be skimmed off and placed in the bottom of the trench with the grassy side of the sods always facing downward. Manure should also be spread along the bottom of each trench, and this can be used in a comparatively fresh condition if the work is performed in the fall.

In digging, the handle of the spade is held in one hand, while the other is placed farther down the shaft. The left foot generally is used to sink the blade almost vertically into the ground to its full depth. If the blade makes too great an angle with the vertical, shallow digging results, and although more ground may be covered in a given time the result is a poor job. It is likewise a mistake to take over-large spadefuls, for this practice leaves untouched ridges which are really within the effective depth of the spade. A slice of earth the width of the spade and five or six inches back from the edge of the trench is an ample spadeful. As the blade reaches its maximum depth the handle is pressed backward and downward in the right hand while the left hand slides down the shaft to a point which permits of lifting the mass of soil carried on the blade with the least expenditure of effort. Then with a quick but easy turn of the wrists the soil-mass is turned upside down and deposited in its new position. A good digger will place every spadeful exactly where it is needed and will not find it necessary to shuffle the soil about, once it has been deposited in position. Such skill, however, is only attained after considerable practice and the beginner may find it difficult to maintain an even surface.

It is always well to remember that under normal circumstances a trench which tends to become larger indicates that the surface of the completed digging is too high, while the reverse is true if the trench is gradually lost.

FIGURE 2 shows the important part of double digging. Here the trench is wider (2½ feet) and the gardener is forking over the lower spit, mixing humus-forming materials with the subsoil. Note the large stones which have been removed from the trench and the line that is stretched between stakes as a guide in digging.

When digging in the fall or winter the surface should be left in a rough condition so that the largest possible area is exposed to the weather.

Double Digging

Double digging differs from single digging in that the process consists of breaking up the soil to a depth of two spits instead of one.

Wherever conditions permit, this preparation should precede the setting out of plants which are likely to remain in the same position for several years. These would include, for instance, roses, shrubs, hedges, herbaceous borders, and asparagus. Those portions of the garden devoted to less permanent subjects should be double-dug every third or fourth year. To avoid an excessive expenditure of labor in any one season, it is wisest to treat one-fourth to one-third of the cultivated area each year.

The trench taken out for double digging should be thirty inches wide and about one foot deep. Just as in single digging, the soil removed is placed near where the work will be finished. Humus-forming material such as manure, compost, leaf-mold, cornstalks, etc., is then forked into the bottom of the trench in generous quantities, being mixed with the subsoil to the depth of one spit. If the subsoil is clayey, a dressing of lime spread over its surface after forking is beneficial. The topsoil from the thirty-inch strip adjoining the first trench is then spaded over onto the newly forked subsoil and in this way a second trench is formed which is treated in the same manner as the first. The topsoil from the third trench is placed on the subsoil of the second, and so on until the finish is reached. There the soil from the first trench is used to fill in the last, and the job is completed.

T. H. Everett.

A GLANCE AT CURRENT LITERATURE*

What makes some hydrangeas blue is discussed from the point of view of the literature available and from recent chemical experiments by E. M. Chenery in the July *Journal of the Royal Horticultural Society*. History of the trait, cultural practices, natural soils, and the various chemicals which have been applied are given consideration in this scientific yet highly practical treatise.

* * *

The story of tea is told by Llewellyn Williams in Botany Leaflet 21 of the Field Museum of Natural History.

* * *

Canadian folklore is enriched by a study, recently published, of Canadian botany in the epoch of Jacques Cartier, explorer of the middle sixteenth century. A biography of Cartier is given, with a résumé of the written works which resulted from his three voyages into the New World. Brief histories also are given of his contemporaries and his precursors, including the Scandinavians. Thirty-two pages are devoted to a descriptive catalog of the plants which were mentioned by the voyagers, followed by a long bibliography and index. Jacques Rousseau, professor of botany, has written the work in French as *Contribution du Laboratoire de Botanique de l'Université de Montréal,* No. 28.

* * *

The previous *Contribution* (No. 27) was concerned with the oaks, principally in the Laurentian mountains, north of Montreal. Frère Joseph Cléonique is the author.

* * *

A topic which ever demands elucidation, especially for novice gardeners, is that of the uses of botanical names, as well as common names, for garden plants. Julia Yerkes Atkinson handles the subject effectively in the *Bulletin of the Garden Club of America* for September under the heading "The Naming of Plants." In less than ten pages she gives a useful botany lesson to gardeners.

* * *

A noteworthy contribution to geobotany is contained in an Italian survey of the island of Hispaniola in the Antilles, by Rafael Ciferri. It appears as No. 8 of Vol. IV of the *Atti del'Istituto Botanico del'Università di Pavia.*

CAROL H. WOODWARD.

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* All publications mentioned here—and many others—may be found in the Library of The New York Botanical Garden, in the Museum Building.

NOTES, NEWS, AND COMMENT

The new lecture course on "Fundamentals of Gardening" which is being given late Thursday afternoons in the museum building is being attended by more than thirty students. In addition to the ten student gardeners for whom the course is required, seven other garden employees, including apprentices, are attending the weekly lectures voluntarily. Thirteen of the others who have registered for the course have subscribed to membership in the Garden, while one represents a garden club which as a group is a member.

* * *

A recent inventory reveals that the Garden has more than two thousand species and varieties of cacti and other succulents in its conservatory collections. This group of plants has been increased greatly within the last few years by exploration, chiefly in South Africa, by exchange of plants and seeds with other institutions, and by gifts from persons interested in cacti and succulents. Many of the older plants are the type species (or their progeny) on which the identifications in Britton & Rose's "The Cactaceae" have been based.

* * *

The smaller corm of *Amorphophallus titanum* which was being exhibited in the dormant state while the Garden's gigantic specimen was in bloom last June has put out its second leaf this fall. The younger corm was tubbed on June 14, weighing then 20 pounds and measuring 37 inches in circumference. The new bud broke ground on August 7 and first showed signs of being a leaf September 29, when it was 45 inches high. Just before the much-divided blade began to expand, the plant measured 11 feet 3 inches from the soil to the tip of the still erect leaf-blade. On October 26, as the leaflets started to open out into an umbrella-shaped blade, the petiole stood 8 feet 11 inches high. Already it is the tallest Amorphophallus leaf produced at the Garden. The corm, which began its life in its native home, Sumatra, was received by the Garden from Boris A. Krukoff.

* * *

On Monday, October 4, Dr. F. J. Seaver was the principal speaker at the meeting of the New York Mycological Club in the American Museum of Natural History, discussing his own researches on the Ascomycetes and particularly the Discomycetes. Collections of fungi made by members over the previous week-end were displayed.

* * *

Dr. C. L. Shear, for many years connected with the Bureau of Plant Industry, Washington, D. C., during September spent several weeks in the mycological herbarium of The New York Botanical Garden carrying on research with the Xylariaceae, one of the larger

groups of Ascomycetes. Though recently retired as principal pathologist in the United States Department of Agriculture, he is continuing his work in mycology as collaborator in the Division of Mycology and Disease Survey.

* * *

Early in September Dr. A. B. Stout spent a week in Maine evaluating the various plantings of the Oxford Paper Company's hybrid poplars and the work which is being done with them by the Forest Service under the immediate direction of Dr. E. J. Schreiner. Dr. Stout is a collaborator in this research.

* * *

Dr. Walter Robyns, Director of the Belgian State Botanical Garden at Brussels and Professor at Louvain University, was a visitor in New York the middle of August. While here he spent several days at The New York Botanical Garden and was the guest of honor at a dinner given by members of the staff at the Faculty Club of Columbia University. Dr. Robyns came to the Garden again at the end of October before sailing for his home, after having traveled to Hawaii and back visiting fifteen national parks on the way.

* * *

Dr. A. B. Stout spent two weeks during September at the New York State Experiment Station at Geneva in further studies concerned with the project of breeding for seedlessness in hardy grapes. About ninety seedlings which have borne this year for the first time have seedless or near seedless fruit. They are all hardy in New York, and several appear to be excellent and promising for commercial culture.

* * *

At the approach to the north gate of the Thompson Memorial Rock Garden a large evergreen planting has been completed this fall. Against a background of Carolina hemlocks (*Tsuga caroliniana*), more than a thousand rhododendrons, both native species and hybrids, some of them of large size, have been set out. Among them are also about fifty specimens each of the native azalea or pinxter-flower, *Rhododendron nudiflorum* (*Azalea nudiflora*), and of mountain laurel (*Kalmia latifolia*).

* * *

Following the plans of Mrs. Ellen Shipman, landscape architect, a hedge of yew has been planted beside the new sunken path opposite the perennial border of the Advisory Council at the Botanical Garden. The plants, which are 20 inches high, are of the upright-growing type.

THE NEW YORK BOTANICAL GARDEN

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PUBLICATIONS OF THE NEW YORK BOTANICAL GARDEN

Books

An Illustrated Flora of the Northern United States and Canada, by Nathaniel Lord Britton and Addison Brown. Three volumes, giving descriptions and illustrations of 4,666 species. Second edition, reprinted. $13.50.

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pages and 601 figures. 1932. Price, $5.50 postpaid.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages, illustrated. 1935. $1.65.

Flora of Bermuda, by Nathaniel Lord Britton and others. 585 pages with 494 text figures. 1918. $3.50.

A Text-book of General Lichenology, by Albert Schneider. 230 pages. 76 plates. 1897. $2.50.

Periodicals

Addisonia, semi-annual, devoted exclusively to colored plates accompanied by popular descriptions of flowering plants; eight plates in each number, thirty-two in each volume. Now in its twentieth volume. Subscription price, $10 a volume (two years). Not offered in exchange. Free to members of the Garden.

Journal of The New York Botanical Garden, monthly, containing notes, news and non-technical articles. Subscription, $1 a year; single copies 10 cents. Free to members of the Garden. Now in its thirty-eighth volume.

Mycologia, bimonthly, illustrated in color and otherwise; devoted to fungi, including lichens, containing technical articles and news and notes of general interest. $6 a year; single copies $1.25 each. Now in its twenty-ninth volume. Twenty-four Year Index volume $3 in paper, $3.50 in fabrikoid.

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North American Flora. Descriptions of the wild plants of North America, including Greenland, the West Indies, and Central America. Planned to be completed in 34 volumes, each to consist of four or more parts; 81 parts now issued. Subscription price, $1.50 per part; a limited number of separate parts will be sold for $2 each. Not offered in exchange.

Contributions from The New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above. Price, 25 cents each, $5 a volume. In the fourteenth volume.

Memoirs of The New York Botanical Garden. A collection of scientific papers. Volumes I-VII. Titles on request.

Direct all orders to The New York Botanical Garden, Bronx Park, New York, N. Y.

* * *

DIRECTIONS FOR REACHING THE BOTANICAL GARDEN

The New York Botanical Garden is located in the Bronx, immediately north of the Zoological Park at Fordham Road, and at the south end of the Bronx River Parkway. It may be reached by local trains from Grand Central Terminal to the Botanical Garden Station (200th Street).

To reach the Garden by the Elevated and Subway systems, take the Third Avenue Elevated to the end of the line (Bronx Park Station); from the East and West Side subways, transfer from the Lexington or Seventh Avenue line to the Third Avenue Elevated at 149th Street and Third Avenue. By Eighth Avenue subway (Independent system) take a C or CC train to Bedford Park Boulevard (200th Street), then walk east to the Garden.

To come by motor from the city, drive north on Grand Concourse to Bedford Park Boulevard (200th Street), turn east there, and cross the railroad bridge into the Garden grounds.

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CAROL H. WOODWARD, Editor

DECEMBER, 1937

BLACK OAK (*Quercus velutina*) IN THE THOMPSON MEMORIAL ROCK GARDEN — Cover Photograph, by Fleda Griffith

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LECTURES AND COURSES

Every Saturday afternoon from September until June there is a free public lecture in the Museum Building at The New York Botanical Garden. Sometimes a travel talk is given, with emphasis on the plant life of foreign lands or distant parts of our own country; often the subject is horticultural, and the speaker tells, with the aid of colored slides depicting gardeners at work, how roses, perennials, bulbs, shrubs, and other plants are grown or how a garden is kept free from diseases and insect pests.

The nature-lover is given special attention several times each year with lectures on the trees, flowers, and shrubs of the countryside. The results of scientific research told in simple language, good books for gardeners, edible and poisonous mushrooms, Indian lore, and landscape gardening: these are typical topics at the Saturday afternoon talks.

For those who wish more sustained information on horticulture and nature study, the Garden offers several courses, free to members up to the amount of their annual fee. A nominal charge is asked of outsiders, and New York teachers are welcomed at half price.

These are direct public services, in a class with the countless questions which are answered daily by members of the staff in person, over the 'phone, and by correspondence. The Botanical Garden always aims to be of immediate help to people who look to this institution to satisfy their inquisitive minds on subjects of botany, nature study, and gardening. The influence felt is broad as the effects of this work enter the streams of knowledge which flow out in many directions from their source.

One of the farthest reaching influences of all is the indirect one which accrues from the training of professional gardeners. As more men with sound knowledge of garden science and plant culture are sent out from the Botanical Garden to parks, estates, and nurseries, the standard of horticulture in America is steadily being raised.

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JOSEPH R. SWAN CHOSEN AS PRESIDENT OF THE BOTANICAL GARDEN

Joseph R. Swan was elected President of The New York Botanical Garden by the Board of Managers at its meeting November 19. He succeeds Henry W. de Forest, who resigned after serving as President since 1928.

Mr. Swan, who is President of Edward B. Smith & Company, bankers, at 31 Nassau Street, has been a member of the board of the Botanical Garden since 1934. At the annual meeting last January he was elected Treasurer.

Like his predecessor, Mr. Swan maintains an intense and active personal interest in horticulture, as well as in the progress of the Botanical Garden, both as a scientific and public institution.

TREES IN PROFILE

Telling How to Identify Some of our Native Trees in Winter

The sharp silhouettes of the leafless trees against the brilliant blue of the winter sky reveal a wealth of varied detail. The delicate tracery of the twigs adds as much to the bold outlines of the trunk and branches as do the delicate brush strokes to the finish of a Van Eyck painting. Color is not wanting in the winter tree scene, but the dominant tones of dark gray, blue and white lend themselves better to pen and ink than oils. Yet, no etcher has ever done justice to even our commonest trees. So we turn here to photographs to set before our eyes one of the chief beauties of the winter landscape.

Each tree has its individuality, and each kind of tree its distinguishing features, many of which are easily seen at a distance. The clusters of winter buds at the ends of all of the slender twigs and the persistence of last season's dead leaves characterize the oaks. The position of the main branches relative to the trunk is distinctive in the elms, lindens, and also the different oaks. An opposite arrangement of the side twigs distinguishes ash and maple from all other common trees. The general outline of the crown, whether even as if clipped to shape or jagged and irregular, is another distinguishing character of some of our native trees which makes them easily recognized at a distance. There are many other individual traits, as outlined below. For winter photographs of the first ten trees described, see pages 284-285.

*1. **American Elm.*** (*Ulmus americana*). Our common native elm has several nearly erect branches, which spread in the crown into a broad vase shape. The numerous small twigs make a well filled top, moderately irregular in outline. Individual elms assume many forms, from tall and narrow to low and spreading, but the general effect is of a large ample tree whose branches and twigs nearly always arise at exactly the same angle throughout each tree.

*2. **White Oak.*** (*Quercus alba.*) Of all of the American oaks —and there are many—the white oak takes first place here in the northeast. The broad spreading crown, with a width often one and a half times its height, and the heavy gnarled branches, the lower ones reaching out almost horizontally, distinguish this striking tree as clearly as does its flaky ash-gray bark.

3. Pin Oak. (*Quercus palustris*). In sharp contrast to the heavy majesty of the white oak is the almost effeminate delicacy of the pin oak. Its narrow column of main trunk reaches far up into the elongated crown. The tapering lower side branches regularly droop downward and die early, leaving persistent dead "pins" projecting from the lower trunk. The successive branches up through the crown tilt progressively upward, from drooping to horizontal, then at sharper and sharper angles until they finally stand nearly erect toward the top of the tree. The individual

The white ash (11) is distinguishable by the trim pairs of pale gray branchlets which leave the main branch at an angle of 45 degrees.

slender tapering twigs are straight and shapely, unlike the gnarled ones of the white and black oaks. Like those of all of the other oaks, however, they terminate in stubby clusters of winter buds, in this species very diminutive and covered with soft dark gray down.

4. ***Silver Maple.*** (*Acer saccharinum*). One of the commonest of our quick-growing short-lived street trees, the silver maple has the typical opposite arrangement of the pairs of branchlets along the slender branches which is characteristic of all of the maples. The main branches reach out into strong terminal twigs, which give a rather pleasing irregularity to the general outline. The most characteristic feature of the silver maple in winter is a minor one. The lower branchlets often extend first a little upward from the trunk, then they curve down and reach upward again to the tip in a modified S-curve. In bright light the twigs have a tawny undertone to their gray color which is also distinctive.

5. ***Buttonwood*** (*Platanus occidentalis*). ***Plane-tree*** and ***Sycamore*** are two of the other names for this unmistakable tree. Its pale patches of bare inner bark which appear where the older rough bark has been shed in irregular sheets from the upper trunk give it a somewhat ghostly appearance. The branches are twisted and gnarled, because the twigs develop no terminal winter buds. Instead the branches continue their growth from side buds every year; thus each season produces another kink in each branch. The wide spread of the upper branches and the crowded clusters of twigs near their ends give the tree a rather jagged outline.

6. ***American Linden*** (*Tilia americana*). All of the side branches of the American linden seem to start at an acute angle of about thirty degrees from the rough black trunk. As the tree increases in size, the lower branches are forced downward and outward in search of light. The trim oval crown maintains its shapeliness even in late middle age, the twigs apparently holding a set pace in their growth outward. Dark red, lopsided, short winter buds on slightly zigzag terminal twigs characterize most lindens, if one gives them close enough inspection for such fine details.

7. ***Sour-gum*** (*Nyssa sylvatica*). Possessing one of the toughest, most cross-grained of woods, the sour-gum bears rather coarse, smooth, straight, horizontal twigs which are correspondingly tough. The main branches are sometimes horizontal, sometimes ascending. The horizontal arrangement of the twigs is apt to give the whole

Like an old-fashioned candelabrum is the sassafras tree (12), whose branches leave the trunk horizontally, then become almost vertical.

tree a flat-topped, stubby appearance, which is belied by its straight trunk. The flat top is not revealed in the accompanying picture, for it was taken too close to the tree to show the upper branches in their true position.

*8. **Sugar Maple** (Acer saccharum).* Though similar in twig details to the silver maple, the general form of the sugar maple

is evener. The side branches, which are usually rather crowded, ascend at progressively steeper angles up the trunk, forming, with the stiff even brushlike twigs near their tips, a regular oval crown easily discerned against the winter sky. This clean-cut outline must have been a great help to the pioneer sugar gatherers in spotting producing trees in newly discovered sugar-maple groves.

9. Yellow Birch (*Betula lutea*). In its general silhouette the yellow is not easily told from the black birch. In both the slender, crowded, apparently interlacing twigs reach out into a ragged fringe in the broadly oval crown. But the yellow birch has rather coarser, heavier twigs than the black or river birch (*B. nigra*), and the shreddy yellow bark which comes curling off the trunk in paper-thin sheets is a sure mark of distinction for this species.

The white, gray, and paper birches are of course very different trees, easily known by their pale, almost white trunks, and further differentiated from each other by details of character in the bark.

10. Sweet-gum. (*Liquidambar Styraciflua*). With the spray-like upward sweep of its outer twigs from the main branches, which reach upward gently, the sweet-gum scarcely needs the persistent bur-like fruit-balls hanging from the rather coarse twigs to identify it. Some sweet-gums, but not all, develop corky wings in the young twigs. The broad spreading crown of bright ash-gray twigs contrasts with the almost black-gray main trunk of this swamp and wet-land tree.

11. White Ash (*Fraxinus americana*). The coarse blunt twigs of the white ash always occur in pairs, standing out at forty-five degree angles from the branches, which in turn form about the same angle with the main trunk. The reticulate-ridged bark of an old trunk is equally distinctive at close inspection. The occasional other species of ash have similar family traits, but differ in minor details, such as the downy, slender twigs which are found on the red ash (*Fraxinus pennsylvanica*).

12. Sassafras (*Sassafras variifolium*). The vivid green, aromatic twigs of the sassafras curl upward from the gnarled branches until their upthrust tips become nearly vertical. The main branches also curve up from a nearly horizontal position at the main trunk. The whole effect is of an old-fashioned cluster candelabrum, with myriads of tiny green candles on a many-branched upright stand. The soft dark bark of this frequently seen tree is deeply fissured. The durable wood of the sassafras is little appreciated because the trunk seldom attains enough size to make good lumber.

Resembling the buttonwood in outline, the shagbark hickory (13) is easily recognized by the perpetual shedding of long strips of tough outer bark.

13. Shagbark Hickory (*Carya ovata*). Valued alike for its delicious nuts and its tough strong wood for ball-bats and axe-handles, the shagbark hickory has much of the general contour of a buttonwood tree, but has even more twisted branchlets and twigs. The main branches reach upward and outward in a manner suggestive of an elm. But the shagbark is so easily told by its shaggy bark, shredding off in long, thick, tough strips, that few people pause to look for any other traits of tree form or details of bud and twig.

BROADCASTS FROM SOUTH AMERICA

Dr. A. C. Smith spoke briefly over the radio the night of November 17 in the first broadcast from the base camp of the Terry-Holden American Museum Expedition in the southern part of British Guiana. Describing the vegetation of the savannah region where he was located, he said it resembled that of the western plains of North America, and contained shallow ponds filled with waterlilies, pickerel-weed, and bladderwort. He also mentioned some of the common trees of the region, including the sandpaper-tree, whose leaves are so rough that the natives use them to smooth the wood on their harpoons. He had already spent one day in the forests to the south, where he would later do extensive exploring, and described the method of collecting specimens from trees with the aid of three or four Indians, getting not only leaves, flowers, and fruits of the tree itself, but also many epiphytes and parasites from the higher branches.

When the second program was given on November 24, Dr. Smith was already pushing through the forest with the other scientists, so the broadcast was given entirely by Orison W. Hungerford, radio man, and Neil MacMillan, journalist for the expedition. They said they had journeyed 500 miles from Georgetown, and were located then near the border of Brazil. From their thatched house of palm leaves atop a small hill at the edge of the jungle they could look across to the Akarai range which stretches to the south along the Brazilian border, where the rest of the party were journeying in their attempt to get biological and botanical specimens and to learn some of the medicinal uses of the native plants.

Mr. Hungerford said that by means of portable radio equipment contact would be maintained in the future with the scientific party, and that radio messages relayed from their jungle camp would be broadcast to America.

The programs from the expedition are being heard in the United States through R.C.A. communication, and are being sent through the air by the National Broadcasting Company over stations WEAF and WJZ.

To reach the base camp from which the explorers sent their program, the party had traveled 300 miles up the Essequibo River, then turned westward up its tributary, the Rupununi, for 150 miles,

crossing the Kanaku range by boat, and stopping at John Melville's ranch near Dadanawa. From there, they journeyed by mule, bullock, and foot across the savannah country until they reached the edge of the jungle on the south.

A third broadcast, in which Dr. Smith participated, was heard the night of December 1.

LECTURE COURSE IN OUTDOOR GARDENING BEGINS NEXT MONTH

The second term of the new lecture course in practical gardening, which is designed for the student gardeners but opened to the public, will commence shortly after the new year. P. J. McKenna, Foreman Gardener, will conduct this series, which will deal with outdoor gardening. The first lecture will be on January 6 at 4:45 p.m. in the Museum Building.

To non-members the fee for the series is ten dollars. Members who are not registered in other courses this year may attend these lectures without cost. Newcomers to the Garden may apply the ten-dollar fee for the course to a membership, and thus receive subscriptions to the Journal and Addisonia, a share in the distribution of surplus plants, and other privileges which are offered to members.

Colored slides picturing many of the plants and types of planting to be discussed, also showing important operations in garden construction and maintenance, will be used to illustrate portions of each lecture.

The subjects of the twelve lectures, which will be concluded March 24, will be:

Hardy annuals and biennials, their selection and culture, including the time of sowing and general management.

Half-hardy annuals, the same.

Herbaceous perennials (1) for different situations, such as edging, ground-cover, shade, and difficult situations.

Herbaceous perennials (2) for the hardy perennial border, with emphasis on the construction and maintenance of such a planting.

Hardy bulbs (1) for naturalizing in grass, in woodlands, and in the rock garden.

Hardy bulbs (2) including lilies, for formal planting.

[*Turn to page 286.*

SOME FAMILIAR NATIVE TREES
IN WINTER ASPECT

1. *The shapely American elm.*
2. *The white oak with gnarled branches.*
3. *The delicate pin oak.*
4. *Silver maple. Note the opposite branchlets.*
5. *Buttonwood, with peeling bark.*
6. *American linden; its crown is oval.*
7. *Sour-gum, with twigs always horizontal.*
8. *The cherished sugar maple.*
9. *Yellow birch, with ragged fringe of twigs.*
10. *Sweet-gum, whose main branches sweep upward.*

Photographs by Fleda Griffith.

Roses, year-around care for the production of abundant bloom on disease-free plants.

Half-hardy bulbs and tubers such as dahlias, gladioli, and tuberous begonias, two lectures.

Hardy aquatics, their propagation, culture, and care, with a discussion of the best varieties.

Lawns, their construction and maintenance.

Rock gardens, soil preparation, planting, and care.

A GLANCE AT CURRENT LITERATURE*

The scattered literature of the nineteenth century regarding the vegetative reproduction of the fern is assembled by Ilda McVeigh of the University of Missouri in the *Botanical Review* for September.

* * *

Some hardy iris hybrids have been obtained by crossing the northern species, *Iris versicolor* and the southern *I. virginica* with the Asiatic *I. laevigata* and its variety *albopurpurea.* These are now ready for evaluation by growers, it is announced in the *Bulletin of the American Iris Society* for September in an article by Clyde Chandler and Dr. A. B. Stout, who describe their work in the breeding of irises over the past nine years.

* * *

Dr. William C. Steere of the University of Michigan has contributed the Calymperaceae and Dr. C. T. Frye of the University of Washington the Polytrichaceae in Part 2 of Vol. I of A. J. Grout's *Moss Flora of North America,* which appeared in August.

* * *

Among recent publications of the Department of the Interior are bulletins giving complete descriptions of Death Valley National Monument and of Hot Springs, Acadia, Carlsbad Caverns, and Hawaii National Parks.

* * *

"Agronomy's Contribution to Flood Control and Drought Relief" is the title of an article by C. R. Enslow in the March number of *Soil Conservation.* A five-point program is outlined, covering the growth and storing of certain crops, along with the proper use and care to avoid misuse of the land.

* * *

A check-list of plants of Grand Canyon National Park has appeared as Bulletin 6 of the Park's Historical Association.

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* All publications mentioned here—and many others—may be found in the Library of The New York Botanical Garden, in the Museum Building.

A new household palm, *Neanthe bella,* is described by O. F. Cook of the United States Bureau of Plant Industry in *Science* for August 6. A native of eastern Guatemala, discovered in 1902, this plant is considered desirable because it remains dwarf in stature and because it flowers frequently, starting at two or three years of age and producing inflorescences three or four times every year. The seedling leaves, instead of being grass-like as in other palms, are pinnate from the very start.

* * *

Breeze Hill News for June devotes an entire issue to daffodils of different types with descriptions and excellent photographs of many.

* * *

Characters which distinguish the Siberian from the Chinese elm (*Ulmus parvifolia* from *U. pumila*), both of which are in cultivation but much confused in America, are outlined by Leon Croizat in the June 1 number of *The American Nurseryman.*

CAROL H. WOODWARD.

WINTER LECTURES AT THE GARDEN

Motion pictures and stills, both in color, illustrated the opening lecture of the winter season in the Museum Building at The New York Botanical Garden. The subject was Bermuda and the speakers were Dr. Fred J. Seaver and Dr. Edmund J. Fulling, who presented their travel talk on December 4.

Other lectures in the regular Saturday afternoon series, which take place at 3:30 p. m. and last one hour, are as follows:

December 11. "Botanists, Real and Otherwise," Dr. John Hendley Barnhart, Bibliographer.

December 18. "Recent Trends in Gardening Books," Miss Elizabeth Hall, Librarian.

January 8. "Indoor Gardens," Mr. James G. Esson, Superintendent, Mrs. Roswell Eldridge Estate.

January 15. "Exhibiting in Cultural Classes at Flower Shows," Mr. T. H. Everett, Horticulturist.

January 22. "Seedless Grapes," Dr. A. B. Stout, Director of the Laboratories.

January 29. "Collecting in the Rockies," Dr. W. H. Camp, Assistant Curator.

February 5. "Diseases and Pests of Ornamentals," Dr. B. O. Dodge, Plant Pathologist.

February 12. "Landscaping," Mr. A. C. Pfander, Assistant Superintendent.

February 19. "The Romance of Plant Names," Dr. H. A. Gleason, Assistant Director and Head Curator.

February 26. "Our National Parks," Dr. Harold N. Moldenke, Associate Curator.

NOTES, NEWS AND COMMENT

Summer activities of scientific groups were described at the conference of the Botanical Garden's staff and registered students November 10. Dr. H. A. Gleason reported on the meetings of the Botanical Society of America, while Dr. Fred J. Seaver told of the mycological foray which he attended at Hanover, New Hampshire, in August. In addition, Dr. A. B. Stout outlined recent progress made in the breeding of hardy seedless grapes. Dr. William J. Robbins presided at the close of the meeting.

* * *

The Botanical Garden has just received from the estate of Kenneth K. Mackenzie $8,000 from the bequest which was announced in the Journal for December, 1934. Mr. Mackenzie was formerly a member of the Board of Managers and for many years was an enthusiastic amateur botanist, spending much of his spare time in research on the Cyperaceae, which he monographed for *North American Flora.* In addition to the bequest of money, there is a series of about 500 drawings of North American species of *Carex.* The use of the fund is restricted to the publication of these illustrations.

* * *

Ornamental algae from the coasts of California, the Bahamas, the West Indies, Bermuda, Florida, and Long Island, New York, will comprise a special exhibit in the main rotunda of the Museum Building from December 24 through January 7. The sixty numbers to be shown are representative of the Garden's growing algological herbarium, which now contains about 80,000 specimens, including both marine and fresh-water groups. The exhibit is being arranged by Miss Rosalie Wiekert.

* * *

Dr. Forman T. McLean resigned as Supervisor of Public Education, effective December 1. Continuing his residence in Bronxville, N. Y., he plans independently to further his research on fragrance in gladioli and the breeding of lilies for gardens.

To Dr. A. B. Stout has been assigned the executive work of the former Supervisor of Public Education. Garden clubs which are members of the Botanical Garden will deal directly with Dr. Stout, who is particularly fitted for this work, since for years he has had extensive contacts with such organizations and with individual horticulturists through his work in plant breeding and in lecturing.

* * *

During October Dr. A. B. Stout gave an address on "Incompatibilities in Flowering Plants" before members of the American Society of Plant Physiologists at Purdue University. This address was also given before an assembly of the various botanical seminaries at the University of Wisconsin. During this period Dr. Stout visited the Morton Arboretum at Lyle, Illinois, the Univer-

sity of Wisconsin Arboretum and Wild Life Refuge, and various reforestation plantings near Wisconsin Rapids, Wisconsin. A trip was also made along the Miami River in western Ohio to collect fruits and seeds of papaw, walnut, hickory and beech. Several trees which produce fruits of large size were located and seeds were obtained for possible use by the United States Forest Service of which Dr. Stout is a collaborator.

* * *

Two additional parts of *North American Flora* were issued at the end of November. The first one deals with the water-molds (Saprolegniales and related orders), a group of fungi some of which attack live fish and often cause serious damage in aquaria. It has been prepared by William Chambers Coker, Professor of Botany at the University of North Carolina, and Velma Dare Matthews, also of North Carolina University, who have spent many years studying this group. The second contains four families: the Pontederiaceae (pickerel-weeds and their relatives) by E. J. Alexander; the Eriocaulaceae (pipeworts) by Harold N. Moldenke; the Xyridaceae (yellow-eyed grass) by the late Swedish specialist in that group, Dr. G. O. A. Malme; and the Mayaceae (a group of subtropical aquatics) by A. C. Smith.

REVIEWS OF RECENT BOOKS

(All publications reviewed here may be consulted in the Library of The New York Botanical Garden.)

New England[1]

Full of nostalgic memories of childhood experiences with the wild flowers, Walter Prichard Eaton's "Wild Gardens of New England" is an eloquent plea for conservation.

Without this backdrop of memories painted on his subconsciousness Mr. Eaton's writing would not be what it is today, a prose so poetical that one feels heart and soul the appeal of the New England woods, the rocky hillsides softened by tender hepaticas and trailing arbutus, and the lush marsh growth made more alluring because of the presence of stately orchids and the strange pitcher-plants and the sundew.

Before the intellectual comes the emotional appeal, and a book of this type will do more to awaken the public generally to the necessity of preserving our native growth before it has been entirely destroyed by the ruthless than dozens of botanical essays.

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[1] Eaton, Walter Prichard. Wild Gardens of New England. 124 pages, illustrated with photographs. W. A. Wilde, Boston, 1936. $1.50.

The following quotation shows how keenly Mr. Eaton feels that the love of wild flowers means much more than the joy of a fleeting moment:

"I still do believe that the child who hunts the first hepaticas in Spring, and comes with a glad surprise on a stand of fringed gentian in the golden autumn woods, is storing impressions in his memory which will make him a happier if not a better man . . . and I cannot help but believe that a child who in all his early years sees Nature only from the seat of a motor car, or is taught to appreciate wild flowers only as something to climb out and pick and then throw away, will seldom grow up to be a conservationist. . . . Will he become a lover of gardens, a poet of Nature, an artist, a citizen with a passion for civic neatness and shade trees and parks? . . . Are wild flowers, the speaking voice of Nature, after all so unimportant? Are they not worth saving where they still exist, worth bringing back to our roadsides, and worth employing in their common and hardier forms about our dwellings, where children of the new dispensation can see and touch and come to love them?"

MARGARET MCKENNY

FOR THE FUTURE OF THE LAND[2]

Stuart Chase produced a best seller when he wrote "Rich Land, Poor Land," and the book will continue to deserve that rank as long as America still has unsolved problems of conservation to tackle and still has lessons to learn to save the continent from destruction.

He describes the tragedy of the tremendous waste from reckless lumbering operations, from too intensive grazing, improper use of farm lands and use of improper or unsuitable lands for farming (such as steep slopes, or river borders and swamps that should be left to serve as natural flood lands).

Through startling photographs he shows primeval forest and dense grass, then reveals the effect of flood and drought on our land, picturing also how the government is at present working to alleviate the disastrous conditions; he explains further the consequence of floods on fisheries, mining, artesian water supply, preservation of wild life and other accompaniments of recreation, as well as on agriculture and such more obvious activities.

In a series of graphic diagrams, he shows what becomes of water, from the time it falls from the clouds until it is drawn up again from the surface of the earth.

A forceful piece of journalism, this book tells a compelling tale of the tragedy of our land. Only if the whole nation takes heed and acts can the story, as it extends into the future, eventually have a happy ending.

CAROL H. WOODWARD.

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[2] Chase, Stuart. Rich Land, Poor Land. 361 pages, illustrated, indexed. Whittlesey House, New York, 1936. $2.50.

Crops in Hawaii[3]

The new encyclopedia called "Hawaii's Crop Parade" deals with a subject of great importance, and from his excellent treatment of the trade aspects, one is impressed with the author's grasp of that phase of the subject. But his handling of the technical and botanical phases of his subject is decidedly superficial, and in some instances faulty. So, while his analysis of the commercial history is good, his predictions for coffee and fruits are rather optimistic when one recalls the history of the world's coffee supply. As a catalogue of products of Hawaii, and of their commercial importance, the book is interesting, and gives us a glimpse of the great diversity of tropical crops found in these islands. It is unfortunate that the botanical names of many plants mentioned are confused by errors in spelling and typography and also in the determination of a number of species.

Forman T. McLean.

Beginnings in Chemistry[4]

Since all the world is fundamentally of chemical structure, a book entitled "Man in a Chemical World" is bound to deal to some extent with plants which are of concern to the botanist, the gardener, and the plant pathologist, as well as to the general scientist.

It is appropriate that A. Cressy Morrison should be the author of this popular-style educational book, because through the New York Academy of Sciences he has long encouraged the work of young scientific investigators.

Discussing Nature as the great chemist, he gives the growth of a tree as an illustration of the chemical balance in the world. In a later chapter, "Feeding Millions," he writes almost exclusively about plants. He describes the sources and uses of nitrogen, potassium, and phosphorus as fertilizers, the uses of chemicals as insecticides and fungicides for the protection of growing plants, and the functions of chemicals in preserving foods and in creating other valuable products out of food plants.

The book merely skims the surface, so wide is the subject which it attempts to treat, but it will serve as a sound popular introduction, promising stories "filled with wonder" to those who wish to delve further into the fascinating facts regarding the manifold uses of chemistry.

Carol H. Woodward.

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[3] Crawford, David Livingston. Hawaii's Crop Parade. 305 pages, indexed. Advertiser Publishing Co., Honolulu, 1937.

[4] Morrison, A. Cressy. Man in a Chemical World. 291 pages, illustrated with symbolic drawings, indexed. Scribner, New York, 1937. $3.

A NOVEL MUSHROOM CELLAR

For several seasons past a rather conspicuous mushroom has been observed growing in the bottom of the elevator shaft in the Museum Building of The New York Botanical Garden. Since fungi do not require sunlight, it is not unusual to find them growing in such places as cellars, caves and abandoned mines, especially in mines since the temperature usually does not reach the freezing point, but just how this particular fungus became established in the bottom of the elevator shaft, it is difficult to surmise.

Photographs which were recently made were sent with specimens to Dr. Alexander H. Smith of the University of Michigan, who is an outstanding specialist on this particular group. He determined the specimen as *Hypholoma velutinum,* also known under the name of *Drosophila lacrymabunda.* The name *lacrymabunda* means copious tears, and is suggested by the numerous droplets which collect on the sides and edges of the gills. The species is sometimes placed in a special genus, *Lacrimaria,* for the same reason, and is commonly known as the "weeping mushroom".

As intimated, this is one of the gill fungi, so-called because of the gill-like structures, or lamellae, on the under side of the cap. These structures are a device for increasing the surface on which the spores are produced, the spores being microscopic reproductive structures which correspond to the seeds in the higher plants.

The gill fungi are classified by the color of the spores. There are the white, rusty, purple-brown, and the black-spored forms, the color of which may be easily ascertained by placing a cap with the gills downward on a sheet of paper and noting the color of the spore print.

The form considered here is one of the purple-brown-spored species, and is characterized by mottled gills, the mottling made up of groups of dark-colored spores being suspended in the tear-like drops which exude from the gills. The spores are so dark that by the average person they might be called black.

The species has been frequently reported by mycophagists, but its edibility has apparently not been thoroughly tested, for it is usually placed on the doubtful list.

The most deadly poisonous fungi belong to this same group, the gill fungi, but they are white-spored species. Some of the forms with colored spores are mildly poisonous.

FRED J. SEAVER.

The "weeping mushroom" (*Hypholoma velutinum*) which grows in the bottom of the elevator shaft in the Museum Building.

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* Compiled by Rosalie Weikert

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